



Is Classrooms for the Future Changing Teaching and Learning in Pennsylvania Schools? A Preliminary Report on the First Few Months

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Executive Summary

The purpose of the Classrooms for the Future (CFF) initiative is to transform Pennsylvania's high schools, making them more engaging and more responsive to the economic challenges presented by globalization. This high school reform initiative is at the same time an effort to enhance teaching and learning, to promote access to technology and the effective use of that technology, and to increase our ability to compete in an increasingly global marketplace. As such, this reform initiative targets both increasing the number of powerful computers available for student use (a laptop computer on every student desk in every public high school classroom in which the four core subjects are taught), increased access to technology for teachers (a multimedia teaching station in each classroom) and the professional development of teachers providing the preparation and ongoing assistance required to support change and to use these technologies well.

This evaluation used repeated classrooms observations, teacher and student surveys, and interviews with CFF coaches, principals, and building contacts to assess the progress being made in the first few months of the program. The results in this report must be considered preliminary, as due to contract negotiations and other issues, the technologies arrived late in the school, limiting their use by teachers and students. The primary purpose of this report is to look for signs of change in progress, in teaching activity, in student activity, in teacher attitudes, and in student attitudes. Our year two evaluation report will provide better information based on several months of activity.

Some of the statistically significant results that were visible in the first months of the CFF Initiative include:

- **Changes in Classroom Organization**
 - The physical organization of the classroom seems to be changing, with approximately 10% of classrooms moving to a pattern of desks arranged in clusters of three to five desks.
- **Changes in Teacher Activity**
 - Observers reported that in the "post" observations, teachers were spending significantly less time in whole class lecture and spending more time working with individual students and walking through the room observing, and interacting with students.
 - Students also reported a significant decrease in the amount of time teachers spent leading whole class discussions, and an increase in the amount of time teachers spent working with individual students.
 - Comments from interviews with CFF principals, contacts, and coaches substantiate these findings from survey and observation data.
- **Changes in Educational Goals**
 - Teachers were more likely to engage students in activities requiring higher order thinking during the observations conducted at the end of the year.

- There have been significant reductions in the use of teacher lecture or demonstration and in low level, factual, teacher-led discussions.
 - There were significant increases in the use of project- or problem-based learning, authentic learning, multi-modal teaching, peer teaching, and in both informal collaborative learning and collaborative learning with formal assigned roles to participants.
 - Significant increases from pre to post observations were observed in time spent working on most categories of 21st century skills, including Scientific Literacy, Cultural Literacy or Global Awareness, E-communication skills, Social or Personal Responsibility, Creativity, Higher-Order Thinking, Use of Real World Tools, The Ability to Produce High-Quality Products, and Planning, Prioritizing, and Managing Work. Significant differences were not found for Self Direction and Visual Literacy.
- **Changes in Teaching Activity Associated with Student Achievement**
 - Although this evaluation will not, in Year One, look at changes in student achievement because of the very short duration of the CFF program and the comprehensive nature of end-of-year tests, we did use classroom observations to evaluate teacher activities based on five domains of activity associated with increases in student achievement. Statistically significant increases were found for two of the five domains, "Focus/Capacity" and for "Provisions for Evaluation."
- **Changes in Student Activity and Level of Engagement**
 - The pre/post analysis of how students spent their time show three statistically significant differences:
 - Students spent significantly less time listening to the teacher
 - Students spent significantly more time listening to other students in large groups, and
 - Students spent significantly less time "off task" (doing things other than what the teacher had intended).
 - While the *percentage* of students engaged was relatively high in both pre and post observations and did not significantly change from the pre to post CFF observations, there was a statistically significant and noteworthy increase in the *level* of engagement, with students more deeply engaged during the post-CFF observations.
 - Teachers reported that students spend significantly more time working in groups, and that they placed more emphasis on oral reports and presentations since the introduction of CFF.
- **Changes in Technology Use**
 - As might be expected, there was a significant decrease in the number of students who were observed not using technology at all during the lesson, and a corresponding increase in the number of students observed to be using technologies almost the entire class period.

- On the post survey, only 4% of teachers reported that their students use the computers 80% of the time or more, and 46% still reported that their students using them less than 20% of the time. Student reports of the time they spend using computers were much higher.
- **Changes in Teacher Attitudes**
 - Changes between teacher attitudes exhibited in the pre and post surveys were small, perhaps because approximately 75% of teachers perceived technologies as either valuable (46%) or very valuable (28%) at the time of the initial survey. The percentage reporting that they felt technologies were very valuable had increased by 4% by the time of the post survey.
 - Approximately 70% of teachers feel better prepared to teach this year than last year, although about 20% expressed the belief that they do not yet have the technology skills needed to teach their subjects using the best methods available.
 - Ninety percent of teachers reported that they are working harder than they were in past years, and approximately the same number (86%) reported that they are also working longer.
 - Approximately 72% of the teachers reported that the CFF coach had been either valuable (39%) or very valuable (33%), and the three services the coaches provide that were considered by teachers to be most important were:
 - Teaching them to operate computers, networks, or software programs
 - Suggesting ways to incorporate technology to teach the content in their classes, and
 - Solving technical problems.
- **Obstacles to Successful Implementation**
 - This complex, multifaceted reform initiative presents a series of challenges its leaders must understand in order to overcome. The top three issues reported by teachers are: the need for continuing professional development; computer failures, and network downtime.
 - Progress is being made in terms of the time required to repair or replace a faulty computer, as reported by students in a significant difference between pre and post assessments.

Conclusion: It is still very early in the CFF initiative, but there are initial signs that all involved understand that CFF is about new approaches to teaching and learning (not technology), and there is evidence that positive changes are underway.

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Overview

Classrooms for the Future Overview

The purpose of the Classrooms for the Future (CFF) initiative is to transform Pennsylvania's high schools, making them more engaging and more responsive to the economic challenges presented by globalization. This high school reform initiative is at the same time an effort to enhance teaching and learning, to promote access to technology and the effective use of that technology, and to increase our ability to compete in an increasingly global marketplace. As such, this reform initiative targets both increasing the number of powerful computers available for student use (a laptop computer on every student desk in every public high school classroom in which the four core subjects are taught) and the professional development of teachers (a multimedia teaching station in each classroom and the preparation required to use these technologies well).

CFF leaders believe that by adding technology access for student and teachers and by making a significant commitment to the professional preparation of teachers to use these resources well, this initiative will change teaching methods, improve student interest and engagement, and improve learning of academic content and the development of "21st century skills." On September 20, 2006, Governor Edward G. Rendell proposed that, "Classrooms for the Future will not only help to boost achievement while our students are still in high school, but they will be primed for success in college and beyond, especially in fields that require advanced skills with computers and technology" (Rendell, 2006). Further, Governor Rendell proposed that measures of statewide technology access and use, such as those offered by Education Week (*Technology Counts*, 2006), will reflect the change, but that more importantly, "this initiative is about enhancing our schools' learning environment, increasing student achievement and preparing our students to compete in the global job market" (Ibid.). More detail on the CFF initiative can be found in Appendix A.

Evaluation Overview

The evaluation of a complex initiative such as Classrooms for the Future is a significant undertaking with multiple goals. This evaluation will first provide crucial information that will help educational leaders steer the program while in its fledgling stages and will, in subsequent years, provide insights to legislators, educators, and others on the ultimate value of the reform – its effects on student achievement and skill development.

Working with several unit directors at the Pennsylvania Department of Education and a representative of the Regional Educational Lab for the Mid-Atlantic region, we began by

developing a list of questions that would guide the study and would become the headings and subheadings of this report. We were asked to investigate:

- The impact of CFF initiative on teaching practice
- The impact of CFF initiative on student activity
- The impact of CFF initiative on teacher attitudes
- The impact of CFF initiative on student attitudes
- Factors that may be enhancing or limiting the initiatives impact
- The impact of CFF initiative on student achievement (after Year One)
- The impact of CFF initiative on the development of 21st century skills (after Year One).

The nature of the research topics and questions required a multi-faceted evaluation that involves both qualitative and quantitative analyses. For this reason, the evaluation team has used a mixed methods approach, the benefits of which are described by Frechtling and Shays (1997, in Silvernail and Lane, 2004):

Both formative and summative evaluations are enriched by a mixed methods approach. (...) By using different sources and methods at various points in the evaluation process, the evaluation team can build on the strength and weaknesses of any single approach. A multi-method approach to evaluation can increase both the validity and reliability of evaluation data. (pp. 5-6)

Our mixed methods approach incorporates both a qualitative approach (open-ended interviews with CFF coaches, principals, and district contacts) and quantitative approaches (the use of observation tools and teacher and student surveys). In designing this evaluation, we created a matrix and identified the appropriate data sources for each question, choosing, where possible, to use multiple data sources to examine each question.

The CFF Evaluation Team for Year One consisted of 34 researchers representing six universities, two intermediate units, and two school districts. These people were assigned to one or more roles, based on their qualifications, availability, and interests. Our team has invested three months organizing and understanding the five primary forms of data:

- Observations of teaching in the classroom ("pre" and "post")
- Surveys of CFF teachers ("pre" and "post")
- Surveys of CFF students ("pre" and "post")
- Interviews with CFF principals, coaches, and contacts (post), and
- Interviews with CFF leaders at the state level (to understand the purpose of the program and implementation issues).

More information on the instruments and methodology can be found in Appendix B.

The Role of Professional Development in the CFF Program

The changes anticipated as a result of the Classrooms for the Future program represent a significant challenge to the program's leaders. However, research shows that teachers tend to teach as they have been taught (Goodlad, 1990) and that effective, ongoing professional development is required if the reform is to result in important changes in teaching behaviors (Richardson, 2003). As adults, teachers "learn new knowledge, understanding, skills, values and attitudes more effectively when they are presented in the context of real-life applications" (Knowles, Holton, & Swanson, 1998). Because adults learn best in an environment that is relevant, collegial, and in context (Richardson, 2003), the CFF initiative and other important reform efforts in Pennsylvania employ "coaches" - people who understand the teaching and learning context and the effective implementation of technologies in learning, who work along side teachers as they overcome obstacles and implement new processes. The crucial nature of professional development and the role of the coach in CFF underlies several of our research questions which investigate changes in teacher activity, teacher attitudes, and the professional development they are offered. More detail on the role of the coach and additional (very positive) perspectives exhibited during interviews on the value of coaches in the CFF program can be found in Appendix C.

The CFF Year One Implementation Timetable

In the original design of Classrooms for the Future, the technologies were to have been installed early in the academic year. Unfortunately, due to delays associated with the negotiation of such a large and complex contract, which included cost, equipment delivery, maintenance, and professional development issues and more, resulted in a much later installation, with some schools only having the technologies in place for a few months. The implication of these delays is described below. The Year Two implementation will be free of many of the logistical issues present in Year One, and the data gathered in Year Two will represent a much longer impact.

The Limitations of this Year One Evaluation

Because the CFF program has only been in operation for a few months and because the changes it is designed to produce will develop over time, it is impossible to assess the eventual outcomes from preliminary information like the information provided by this report. This report is designed to help leaders of the program understand what changes are taking place in the first few months, so that they might enhance professional development in a certain area, or make other adjustments based on initial observations. The data and analyses presented here are **not** to be interpreted as representing the program's ultimate contributions, but rather are intended as information with which to guide the program.

On a similar note, the "pre" observations and surveys referred to in this evaluation are true "pre" data in some schools, as the technologies had not yet been installed, but were not so for all schools, as the rollout of technologies had begun before observers had been trained and procedures for gathering evaluation data had been in place. We believe, however, that in aggregate, the numbers we will refer to as "pre" are in fact representative of "early" implementation, long before far-reaching changes in teaching behavior would have been expected.

Another limitation had to do with the quantity and, therefore, the quality of the data produced in Year One. Although recipients of CFF funds and equipment were required to participate in the CFF data collection efforts, no mechanisms were in place to enforce compliance. As a result the number of observations, surveys, and interviews available for analysis was lower than anticipated. Since some of the analyses are best done with "matched pairs" of observations (pre- and post-data from a single teacher), the data from the Year Two analysis (during which efforts at enforcing compliance with evaluation requirements will be initiated, and tools allowing responsible parties to track what has been submitted will be in place) will encompass a greater proportion of the CFF teacher and student populations, and will, therefore, be better approximations of the changes underway.

CFF's Impact on Teaching Practice

A primary belief behind the CFF program is that access to technology and a significant professional development effort could change how teachers teach, changing what students are asked to do, which will change student learning. Therefore, the first question we examine is, "Is CFF changing what teachers do?", or, to put it another way, "Is CFF changing teaching practice?" We examine this by looking at what teachers said they were doing in pre and post surveys, administered approximately six weeks apart, by looking at what students report that their teachers are doing in pre and post surveys (also administered approximately six weeks apart), and by using two different observation protocols through which trained observers gathered data on what they saw happening in the classrooms in classroom visits conducted approximately seven weeks apart. Conclusions from these analyses will be compared to the impressions gathered from coaches, contacts, and principals in our interview process.

The discussion for this section of the report will be guided by twelve questions:

1. Has CFF impacted the amount of technology access by teachers?
2. Has CFF changed classroom layout (arrangement of desks, etc.)?
3. Has CFF changed the percentage of time teachers spend lecturing and in other activities?
4. Has CFF changed the "complexity" of class content, moving from "basic skills" to more "higher-order" topics?
5. Has CFF changed the "instructional style" exhibited by the teacher, on a scale from "didactic" to "constructivist"?
6. Has CFF changed the "relevance" of class content, moving from "artificial" to more "real world" in nature?
7. What technologies are being used in the different subject areas, and how is this changing as a result of CFF?
8. Are teachers experiencing any changes in classroom management (discipline problems, time lost in transitions, etc.) as a result of CFF?
9. Are teachers comfortable teaching in CFF classrooms?
10. What different software applications are being used in CFF classrooms?
11. What instructional strategies are used in CFF classrooms?
12. Is there a difference in the attention paid to "21st century skills" in CFF classrooms?

<i>Has CFF impacted the amount of technology access for teachers?</i>
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The CFF Classroom Observation Tool contained eight indicators of access to technology. The observer could select any that applied to describe technology access in the classroom:

- a. Teacher has access to technology
- b. Presentation station is available (projector, speakers)
- c. Electronic Whiteboard is available
- d. 1 student per computer
- e. 2 students per computer
- f. 3-5 students per computer
- g. More than 5 students per computer
- h. Internet access is available to all computers

The percentages observed for each of these items for the pre and post CFF observations is shown in Table 1 below.

TABLE 1

Changes in Access to Technology			
	Pre (N=124)	Post (N=124)	Change
Teacher has access to computer	93%	100%	7%
Presentation station is available (projector, speakers)	52%	73%	22%
Electronic whiteboard is available	23%	81%	59%
1 student per computer	29%	66%	37%
2 students per computer	0%	4%	4%
3-5 students per computer	3%	1%	-2%
More than 5 students per computer	18%	8%	-10%
Internet access is available to all computers	83%	94%	11%

Although the "pre" observations were initiated after some of the CFF technology installations had been completed, making the "pre" numbers in this table higher than they would have been in a true pre/post comparison, the results of **this analysis revealed significant changes in access to technology**, reflecting:

- An increase in the teachers' access to computers (bringing the total to 100%)
- A 22% increase in access to a presentation station
- A dramatic (59%) increase in the availability of electronic whiteboards
- A substantial increase (37%) in the percentage of classrooms in which every student had access to a computer, and
- An increase in the percentage of classrooms in which all computers had access to the Internet.

Although these increases in technology access are expected results, since one of the goals of the CFF project was to provide teachers and students with more technology resources,

it is worth noting that in spite of the observed increase in access to technology, the goals of one-to-one computer use, teacher presentation stations, and electronic whiteboards did not, at the end of Year One, appear to have been attained in all classrooms.

Has CFF changed classroom layout?

On the teacher survey, CFF teachers were asked to indicate which one of these five descriptors best indicated the way their classroom was arranged:

- a. Desks in rows
- b. Small clusters of student desks
- c. Student desks in circles or semi-circles
- d. Desks along classroom walls
- e. Other

The percentages for each of these choices for the pre and post CFF Teacher Survey are presented in Table 2.

TABLE 2

Organization of the Classroom			
	Pre (N=931)	Post (N=631)	Change
Desks in rows	62%	62%	0%
Small clusters of student desks	13%	17%	4%
Student desks in circles or semi-circles	7%	5%	-2%
Desks along classroom walls	3%	3%	0%
Other	12%	7%	-5%

The small changes from pre to post surveys are small, and not statistically significant ($\chi^2 = .15.996$, $p = 0.915$).

However, on the same topic of classroom organization, the observers using the CFF Technology Observation Tool were asked to record one of these following nine options:

- a. Traditional rows
- b. Small clusters of 3-5 student desks
- c. Science lab
- d. Desks arranged in rows; students face each other
- e. Circles or semi-circles
- f. Computer lab
- g. Outside of classroom
- h. Classroom arranged like a lab, or with computers along the wall
- i. Other, please describe and illustrate below

The percentages reported for classrooms during pre and post observations are shown in Table 3.

TABLE 3

Organization of the Classroom			
	Pre (N=124)	Post (N=124)	Change
Traditional rows	69%	53%	-15%
Small clusters of 3-5 student desks	6%	16%	10%
Science lab	2%	5%	2%
Desks arranged in rows; students face each other	9%	10%	2%
Circles or semi-circles	6%	6%	-1%
Computer lab	1%	2%	2%
Outside of classroom	2%	0%	-2%
Classroom arranged like a lab, or with computers along the wall	2%	2%	-1%
Other, please describe and illustrate below	2%	6%	3%

The results of this analysis revealed **significant changes in classroom organization** ($\chi^2 = 315.408$, $p < .005$) **reflecting a decrease in the number of classrooms organized in the traditional "desks in rows" fashion and a large increase in the percentage of classrooms organized with small clusters of 3 to 5 desks** (probably designed to facilitate intra-class interactions and group-based learning), as well as small changes in the percentages reported for other classroom configurations.

Although the changes exhibited between the pre and post teacher survey data were not statistically significant, they both imply that classroom organization is changing, and both indicate an increase in the number of classrooms employing small clusters of three to five desks. The primary difference in the outcomes reported by the two data sources (surveys and observations) is that the changes were more moderate in the teacher survey data and the number of classrooms reporting desks in rows decreased significantly in the observation data while it remained constant in the teacher survey data. One possible explanation for this might be that the teachers to be observed were randomly selected by the evaluation team from among Math and Language Arts teachers (if the school had teachers in these subjects), while the survey respondents represented all subjects and were largely volunteers, as there was no penalty nor follow-up call to increase participation.

Has CFF changed the percentage of time teachers spend lecturing and in other activities?

We are able to investigate this question using the CFF Classroom Observation Tool as well as teacher and student survey data.

We first present the data gathered as trained observers visited CFF classrooms and recorded what they saw using an observation tool created for this purpose. The observers visited the classrooms twice, once early in the program's implementation and again

toward the end of the school year. Only teachers represented by a matched pair of observations were used for this analysis, so that we can be certain that we are comparing changes within a set of classrooms, and not difference between classrooms.

The CFF Observation Tool is described in detail in Appendix B, and tables containing the results of the statistical analyses can be found in Appendix E. The CFF Observers were trained to record the type of classroom activity for three different time-windows of the observed class meeting, the beginning (the first third of the class), the middle (the middle third of the class), and the final third of the class. Table 4 below displays the changes between pre and post for each third of the class and overall. Differences highlighted in red were statistically significant.

Table 4

CFF Observations - Changes in Teaching Activity	First 1/3 of Class			Middle 1/3 of Class			Final 1/3 of Class			Total Diff
	Pre-Mean	Post-Mean	Diff	Pre-Mean	Post-Mean	Diff	Pre-Mean	Post-Mean	Diff	
Whole group lecture/instruction	35.27	22.10	-13.17*	24.51	12.21	-12.30*	20.33	10.67	-9.66*	-11.71*
Leading a whole class discussion	22.50	26.21	4.71	21.14	22.03	0.89	19.50	19.64	-0.24	1.79
Working with a small group	6.44	12.29	5.85*	9.37	20.06	10.69*	10.84	19.48	8.64*	8.39*
Working with individual students	11.51	16.88	5.47*	16.54	23.55	7.14*	20.26	26.19	6.14	6.14*
Walking, observing, and interacting with students	18.02	17.81	-0.21	22.25	20.43	-1.82	19.43	20.65	1.22	-0.11
Working at desk, or other professional work not involving students	5.49	5.53	0.04	5.43	3.47	-1.96	7.79	5.44	-2.35	-1.43

* Indicates statistically significant changes.

As summarized in Table 5 below, these significant changes in teaching activity indicate that **observers found that teachers were spending less time in whole class lecture and spending more time working with small groups and individual students.** (Empty cells in the table indicate changes that were not statistically significant.)

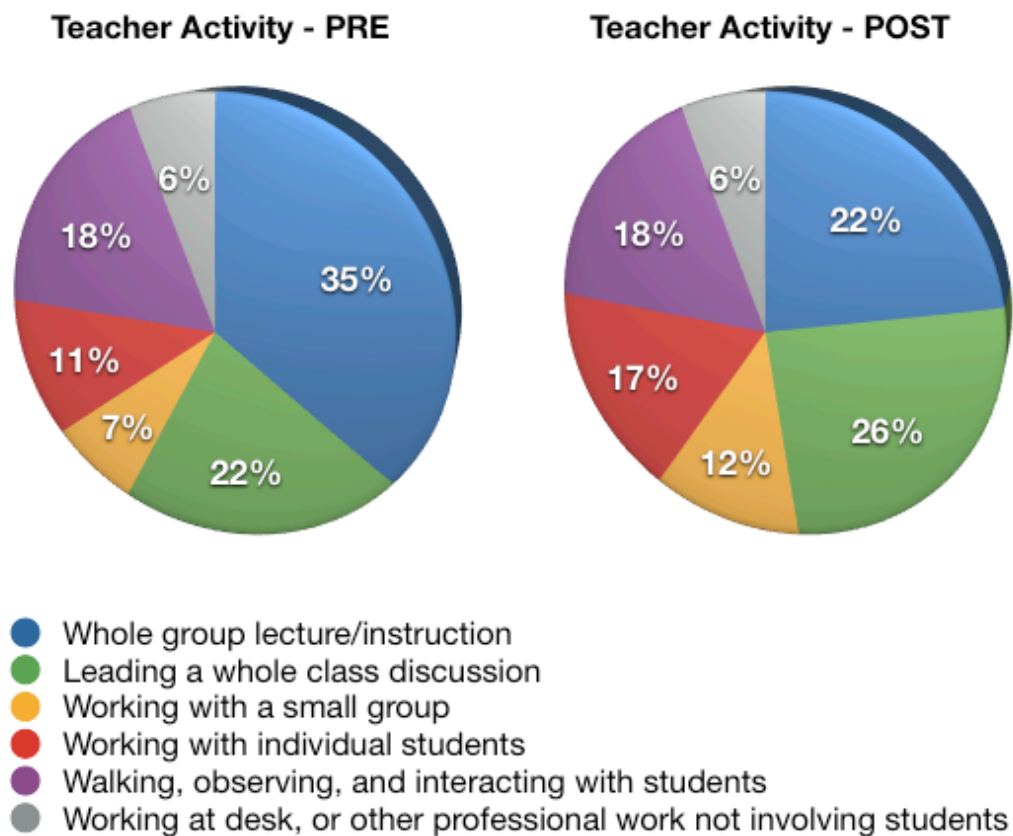
Table 5
Summary of Significant Differences in Classroom Activity

CFF Observations – Changes in Teaching Activity: All Teachers	First 1/3	Middle 1/3	Final 1/3	Overall
Whole group lecture/instruction	13% less time	12% less time	10% less time	12% less time
Working with a small group	6% more time	11% more time	9% more time	8% more time
Working with individual students	6% more time	7% more time		6% more time

Figure 1 below depicts the changes in time spent in each activity as a percentage of the whole class, by presenting pie charts representing time in pre and post observations.

Figure 1

Activity (as Percent of Whole Class)	Pre	Post
Whole group lecture/instruction	35	22
Leading a whole class discussion	22	26
Working with a small group	7	12
Working with individual students	11	17
Walking, observing, and interacting with students	18	18
Working at desk, or other professional work not involving students	6	6



In the student survey, CFF students were asked to indicate the estimated time their teachers spent on each of the following activities:

- a. Leading whole class discussions
- b. Lecturing or telling us about the subject
- c. Working with small groups of students
- d. Working with individual students
- e. Walking around the classroom observing and helping students

The teacher survey also asked respondent to indicate the percentage of time they spent on each of the following activities:

- a. Whole group lecture/instruction
- b. Leading a whole class discussion
- c. Working with small groups of students
- d. Working with individual students
- e. Walking, observing, and interacting with students
- f. Working at your desk, or working on other work not involving students

A summary of the survey data and analyses can be found in Appendix D. There were two small but significant changes in students' perception of the amount of time their teachers spent in different classroom activities, **indicating a decrease in the amount of time teachers spent leading whole class discussions** ($\chi^2=35.906$, $p=.016$), **and a perceived increase in the amount of time teachers spent working with individual students**, with a small but significant percentage of the students indicating that teachers are more frequently spending half or more than half of class time engaged in this type of activity ($\chi^2=3.836$, $p=.027$). **No significant differences were found in how teachers reported engaging in these instructional activities from their pre to post surveys.**

Insights from the Interview Data

According to contacts, coaches and principals, activities in the classroom are less teacher focused and more student focused. A contact described the teachers practice saying, "The biggest change I have seen is their willingness to just let go, to allow the students to learn on their own and their role becomes one of a facilitator. It is interesting because in all of the classrooms that I observed, when the teacher has given up that ownership, the students have become more engaged." A principal stated, "I have noticed that the teacher is now more of a facilitator and that lesson plans are more creative."

Principals and coaches are also observing more "technology-integrated teaching." One coach discussed a teacher's activities saying that she "completely changed her final exam and she made it completely digital. I don't mean in a digital form; she had the kids create a movie, using Keynote, PowerPoint and iMovie, and at the end she is going to give them a DVD with this resource for their future upper-end classes."

Contacts, Principals and Coaches also discussed the increases in active learning they had observed in their districts' classrooms. One contact told us about a teacher who stayed until midnight working. The contact discussed how that person's teaching has changed saying that this teacher previously used very traditional methods but that now "teaches lower level classes, and made liberal use of the interactive whiteboard, posted all kinds of materials online for kids to access when that were not here. That class is a shining example of how much more kids are engaged in the subject matter."

One principal described activities in math classes saying that "teachers were going outside to do web-based geometry with various structures like the light posts and calculating angles and such to requesting permission to do this final in a digital fashion,

having students come up and do things to demonstrate their understanding of whatever they were doing.”

Finally, according to the coaches, principals and contacts, teachers are more likely to differentiate instruction. One contact observed an ESL classroom, reporting, "... and these students ... walked up to the whiteboard and hit the buttons on the top and things are really flowing. These are non-English speaking students, and it is really apparent that these immigrants who step up to these whiteboards seem to have an innate digital ability and are not afraid to push that button or touch this. In math, their English skills are not that much of a factor. Their math skills shine, even though they cannot speak English.”

These and many other comments that emerged from the interview data were identified as recurring themes, which appear to substantiate the reports of classroom observers and students who noted that teachers are appearing to be spending less time in whole-group instruction and whole group discussion and investing more time in engaging with individuals and small groups of students.

Has CFF changed the “complexity” of class content, moving from “basic skills” to “higher order” topics?

The data collectors trained to conduct the CFF Technology Observations were instructed to record their perception of the "complexity" of the class content, by characterizing the work that was being done in the class "on a scale that corresponds to levels of thought such as Bloom’s Taxonomy. On the low end would be work requiring memory and simple application of algorithmic skills. On the high end would be work that requires significant critical and/or creative thought." (Quoted from the instructions to observers. See Appendix B.) The scale used was a seven point Likert-type scale with labels at the two ends reading "Basic Skills" and "Higher Order." As was the case with several other observations, this data point was collected during the first, middle, and final third of the class session.

Table 6 below shows the results for pre and post observations for each third of the class session and for the class overall.

Table 6

	Pre-Mean	Post-Mean	Difference
Basic Skills <=> Higher Order			
First 1/3 of Class	3.40	4.20	0.80*
Middle 1/3 of Class	3.70	4.41	0.71*
Final 1/3 of Class	3.75	4.47	0.72*
Overall	3.62	4.38	0.76*

* Indicates statistically significant difference

The analysis of the results shows significant changes of the reported complexity of the class content from the pre to the post observations in the first ($t=5.21$, $p<.001$), middle ($t=4.96$, $p<.001$), and final ($t=4.52$, $p<.001$) thirds of the class session, indicating that **teachers were more likely to engage students in higher order activities during the post observations.**

The level of complexity of class content was also assessed in the students' survey by asking them to indicate the amount of class time spent on the following activities:

- a. Really complex thinking and problem-solving
- b. Learning processes and "steps" in processes and then following those steps on assignments or tests
- c. Learning information by listening or reading and then remembering that information on assignments or tests
- d. Just kind of sitting back and not really concentrating on anything

Comparison of student responses to pre and post surveys revealed no significant differences. (See Appendix D for data tables and statistical analyses.)

To find out the teachers' perceptions of the complexity of their teaching activities, they were asked to choose an option that best described the content their classes were designed to convey and were provided with the following options from which to choose:

- a. Almost all content knowledge
- b. More content knowledge than higher order skills
- c. Half content knowledge and half higher order skills
- d. More higher order skills than content knowledge
- e. Almost all higher order skills

The teachers' perceptions of the type of content their classes are designed to convey shows **a small but statistically significant change from the pre to post surveys, indicating the possibility that they may be beginning to invest more effort to the attainment of higher order skills as opposed to content knowledge.**

The coaches, principals, and contacts have, during our interviews, also noted an increase in the complexity of the class content. One coach told of a conversation with a teacher who said "I had 25 kids put in an extra 4 to 6 hours to get this done." They told her that they never knew that they understood this so well until they had to put it into a format that they understood and that someone else could understand. The level of excitement and level of understanding from that project just blew her away."

Has CFF changed the "instructional style" exhibited by teachers on a scale from "didactic" to "constructivist?"

The data collectors trained to conduct the CFF Technology Observations were instructed to record their perception of the instructional style of the teacher, using a seven point Likert-type scale with labels at the two ends reading "Didactic" and "Constructivist."

The instructions given the data collections explained the terms as follows: “Characterize the style on a scale from “Didactic” or teacher directed, to “Constructivist” or student-directed and student-centered. Remember that sometimes, even though students are working independently, the task to which they are attending may have been clearly directed by the teacher.” (See Appendix B.) As was the case with several other observations, this data point was collected during the first, middle, and final third of the class session.

Table 7

Instructional Style: Didactic <=> Constructivist	Pre-Mean	Post-Mean	Difference
First 1/3 of Class	3.02	3.92	0.90*
Middle 1/3 of Class	3.43	4.28	0.85*
Final 1/3 of Class	3.37	4.23	0.86*
Overall	3.27	4.14	0.87*

* Indicates statistically significant change

The analysis of the results shows significant changes of the reported instructional style from the pre to the post observations in the first ($t=5.66$, $p<.001$), middle ($t=5.63$, $p<.001$), and final ($t=5.08$, $p<.001$) thirds of the class session, indicating that **teachers appeared to be moving toward more constructivist approaches in the post observations.**

During their interviews, coaches, contacts and principals have noted a shift toward more constructivist teaching techniques. One coach commented, “A real big change is, I think, facilitating. They become more of a facilitator and put the responsibility for learning in the hands of the students,” while another coach explained that not only were teachers’ attitudes about technology changing but that “teachers’ attitudes about letting students be active participants in the learning process have changed. There is a lot more student engagement than there was before.”

Another coach told of changes observed in how teachers approach teaching, saying, “We are finally starting to address the love kids have for the computer and doing everything on the computer. The biggest change I have seen in attitude with teachers is that they are starting to realize that they are not the font of all knowledge in their classrooms. They have become more of a facilitator of student learning. That is not necessarily a comfort zone for teachers. A lot of them think if it doesn’t come from me, the students don’t get it. They are letting it go a little and bringing it all together so that students can construct their own knowledge.”

To investigate if the instructional style of teachers, the student survey probed the didactic/constructivist continuum by asking students to indicate, by selecting one of five options ranging from "the teacher completely" to "students completely", who controls or makes decisions about the following things in class:

- a. The topics studied

- b. The way in which we study the topics
- c. Whether we work together or alone
- d. The specific topics of papers or assignments
- e. The criteria for grading assignments.

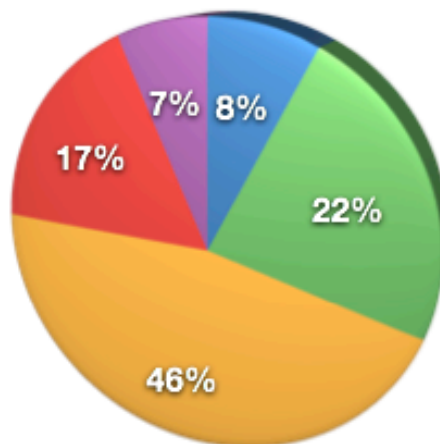
No significant changes were reported by students in their responses to the pre and post surveys.

To determine how the teachers perceived their instructional styles, their survey asked them to choose an option that best described their style:

Figure 2
Teachers Self-reported Instructional Style (by Percent)

Instructional Style Choices (from Teacher Survey)	PRE	POST	Difference	Average
Didactic; providing instruction and direction	8	7	-1	7.6
More didactic than constructivist	23	22	-1	22.3
An even balance of didactic and constructivist	47	45	-2	46.2
More constructivist than didactic	16	19	3	17.3
Constructivist; guiding students as they build understanding	6	7	1	6.6

Instructional Style (combines Pre and Post)



- Didactic; providing instruction and direction
- More didactic than constructivist
- An even balance of didactic and constructivist
- More constructivist than didactic
- Constructivist; guiding students as they build understanding

The teachers' perceptions of their teaching style made a small but statistically significant ($\chi^2=110.725$, $p=0.000$) shift from didactic toward constructivist between the pre and post surveys, as a slightly larger number of teachers perceived their instructional styles as constructivist.

Has CFF changed the 'relevance' of class content, moving from "artificial" to more "real world" in nature?

The data collectors trained to conduct the CFF Technology Observations were instructed to record their perception of the "authenticity of the classrooms activities using a seven point Likert-type scale with labels at the two ends reading "Artificial" and "Real World." The instructions given the data collectors explained the terms as follows: "Does the lesson have a "real-world" context, or is it better characterized as artificial and exercise-based, such as worksheets or essays that summarize content for teacher use only?" (See Appendix B.) As was the case with several other observations, this data point was collected during the first, middle, and final third of the class session.

The means of observations are listed in Table 8, and other statistics are available in Appendix D.

Table 8

Nature of Assignments: Artificial <=> Real World	Pre-Mean	Post-Mean	Difference
First 1/3 of Class	3.43	4.11	0.68*
Middle 1/3 of Class	3.58	4.25	0.67*
Final 1/3 of Class	3.61	4.27	0.66*
Overall	3.54	4.21	0.67*

* Indicates statistically significant difference

The analysis of the results **indicates a shift toward more Real-World projects from the pre to the post observations, with a statistically significant increase for all three thirds of the classes** ($t=4.94$, 4.63 , and 4.36 , respectively, and $p<.005$ for all cases).

To investigate whether the nature of the work students are asked to produce is more Artificial or Real-World oriented, teachers were asked to describe the work their students do by choosing one of the options listed in Table 9 below.

Table 9

Nature of Assignments Given (percentages of teacher responses)	PRE	POST	Diff
a) Exercises and assignments submitted to teacher only	25	20	-5
b) A blend of "a" and "e," but more like "a" than "e"	38	36	-2
c) A balance between "a" and "e"	27	29	2
d) A blend of "a" and "e," but more like "e" than "a"	9	11	2
e) Projects and products that resemble what people do outside of school	2	4	2

These differences from pre to post surveys are not statistically significant, but should the trend continue in this desirable direction this could, in the future, prove to be an interesting and potentially important finding.

What technologies are being used in the different subject areas, and how is this changing as a result of CFF?

The CFF Observers noted at the end of the lesson which technologies had been used by the teacher and by students during the lesson. These percentages of teachers using a variety of technologies can be found in Table 10 below, and the percentages of students using the technologies are reflected in Table 11.

Table 10

Teachers Use of Hardware			
	Pre (N=124)	Post (N=124)	Change
Teacher use of Laptops	31%	65%	33%
Teacher use of Desktop Computer	26%	26%	0%
Teacher use of PDA's	0%	0%	0%
Teacher use of Calculators	17%	15%	-2%
Teacher use of Cameras, Still or Video	2%	13%	11%
Teacher use of TV/VCR	18%	12%	-6%
Teacher use of Probeware	2%	1%	-1%
Teacher use of Microscope Camera/Projector	0%	1%	1%
Teacher use of LCD Projector	31%	52%	20%

Table 11

Student Use of Hardware			
	Pre (N=124)	Post (N=124)	Change
Student use of Laptops	11%	42%	31%
Student use of Desktop Computer	6%	6%	0%
Student use of PDA's	1%	0%	-1%
Student use of Calculators	24%	27%	2%
Student use of Cameras, Still or Video	2%	8%	6%
Student use of TV/VCR	6%	2%	-4%

Student use of Probeware	2%	0%	-2%
Student use of Microscope Camera/Projector	0%	0%	0%
Student use of LCD Projector	3%	9%	6%

As these tables indicate, there has been a large increase in the percentage of teachers using a laptop computer and in the percentage of teachers using LCD projectors, as well as a large increase in the number of students using laptops. However, although these increases are impressive, they are not necessarily as high as might have been anticipated, perhaps due to the arrival of the technologies late in the academic year (in many schools).

Our interview data also support the increased use of technologies in CFF classrooms. There was definite agreement among coaches, principals and contacts that various technologies are now being included in CFF classrooms. A contact detailed one of the most interesting moments of the training when they had “an English teacher do a podcast. He is the last person who would have ever done something electronic in his classroom. He did a really cool podcast on Shakespeare. He teaches English lit and even talks with a bit of an accent. We showed it to his kids the following week and just got rave reviews. The kids were wild about it so he's now on board. He was probably one of those people on the fence.”

A coach said, “This last semester I worked in the English department. We have seen a lot of good things with iMovie, GarageBand, Keynote, iPhoto, and online discussion. We have had a lot of success with that. Kids who were reluctant and shy to raise their hands are participating more. We have seen the teachers become the facilitators. They have really been going online and having book discussions.”

Another contact said, “I have seen some examples where teachers are willing to take risks and utilizing the tools that they have. I have teachers creating their own videos to get students motivated. Another risk is allowing students to participate in threaded discussion online to respond to literature. Some of the English teachers thought that without the verbal interaction there would be a loss, but they found that students who didn't typically respond before are now responding in these threaded discussion and becoming part of the classroom discussion because there was not this front of popular students responding in class. Everyone had to respond.

Are teachers experiencing any changes in classroom management (discipline problems, time lost in transitions, etc.) as a result of CFF?

The CFF observers rated classroom management in the pre and post visits as poor, fair, good, or excellent. The results for pre and post assessments are summarized in Table 12 below.

Table 12

Classroom Management

	Pre (N=124)	Post (N=124)	Change
Excellent	47%	62%	15%
Good	44%	33%	-10%
Fair	6%	4%	-2%
Poor	2%	1%	-1%

These statistically significant ($\chi^2 = 36.717$, $p = .000$) pre/post differences indicate that classroom management, which appeared to be quite good during the pre observations (91% of classes were rated as either good or excellent) got significantly better by the post observations, with an increase of 15% rated as excellent, and a total of 95% rated as good or excellent.

The issue of classroom management was also raised in a question on the teacher survey, and, as illustrated in Table 13 below, was strong in the pre surveys and stayed strong in the post surveys with no significant difference ($\chi^2 = 40.634$, $p = .093$) between pre and post, and with over 70% of teachers agreeing or strongly agreeing that their students are generally well behaved and do what they are asked to do.

Table 13
Teacher Assessments of Classroom Management

Students in my classroom are generally well behaved and do what they are asked to do.	PRE	POST	Difference
Strongly Disagree	1	2	1
Disagree	3	3	0
Somewhat Disagree	7	5	-2
Somewhat Agree	17	16	-1
Agree	41	41	0
Strongly Agree	31	32	1

Are teachers comfortable teaching in CFF classrooms?

During the initial observation cycle, CFF Classroom observers rated 23% of teachers as appearing "fairly comfortable" and 71% as appearing "completely comfortable." During the later observation cycle, **the percentage of teachers rated as "completely comfortable" had risen to 81%** as indicated in Table 14 below. These changes were statistically significant ($\chi^2 = 22.928$, $p = .028$).

Table 14
Teacher Comfort Level

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	Pre (N=124)	Post (N=124)	Change
Could not tell	3%	1%	-2%
Teacher seemed completely uncomfortable	1%	0%	-1%
Teacher seemed fairly uncomfortable	1%	2%	1%
Teacher seemed fairly comfortable	23%	17%	-6%
Teacher seemed completely comfortable	71%	81%	10%

Data from pre and post teacher surveys (see Table 15) also indicate that CFF teachers are comfortable teaching with and without technology. The nearly identical pre and post reports of comfort in the classroom were not statistically significantly different from one another, and they indicate that more than 90% of teachers agree or strongly agree that they feel confident and comfortable while teaching.

Table 15

I feel comfortable and confident while teaching.	PRE	POST	Difference
Strongly Disagree	1	0	-1
Disagree	0	0	0
Somewhat Disagree	1	1	0
Somewhat Agree	7	6	-1
Agree	35	37	2
Strongly Agree	56	56	-0

Our interview data also indicate that teachers are becoming more comfortable using new teaching techniques and technologies. A CFF contact described the growth seen in one of the district's teachers saying, "Some of the teachers who do not have a lot of experience are actually trying to do some things that are surprising themselves. I know one of our teachers was very cautious about how she would implement them in the classroom with the students. She was afraid there was going to be some liability of damage with the computers and read a whole scenario she had to follow on a step-by-step basis and then she saw the teacher next door to her that just winged it and said, 'Let's just do it.' She started to jump over some hurdles and started to do some of the things herself."

What different software applications are being used in CFF classrooms?



















The CFF classroom observers tracked teacher and student use of software, recording the different uses in both the pre and post observations. Table 16 shows the software teachers used during pre and post observations and the changes noted.

Table 16
CFF Observation Data

Teachers use of software			
	Pre (N=124)	Post (N=124)	Change
Teacher use of educational management software – e.g. attendance, grades, lesson plans	10%	23%	13%
Teacher use of word processing	9%	15%	6%
Teacher use of data management (spreadsheets), graphing, or analysis software (EXCEL, SPSS, STATVIEW)	10%	17%	7%
Teacher use of presentation software (PowerPoint, Keynote)	12%	10%	-2%
Teacher use of Email	8%	18%	10%
Teacher use of other communication tools (IM, discussion boards, video conferencing)	2%	2%	0%
Teacher use of desktop publishing software	6%	14%	7%
Teacher use of Web publishing software	2%	6%	4%
Teacher use of Internet for research	4%	4%	0%
Teacher use of multimedia reference CDs for research (e.g. online encyclopedias)	6%	11%	6%
Teacher use of simulations/modeling software	2%	2%	-1%
Teacher use of software for video, graphics, and sound editing or production	2%	9%	6%
Teacher use of Probeware (devices for gathering experimental data)	3%	2%	-2%
Teacher use of Web based digital curriculum or curriculum resources	1%	2%	1%
Teacher use of other Web-based learning activities	2%	5%	2%
Teacher use of other (describe)	3%	9%	6%

But not all of the software used by teachers is captured in infrequent observation visits. For this reason, the CFF teacher survey asked teachers to rate the importance of the most commonly used software applications, ranking them as "Don't Use," "Not Valuable," "Little Value," "Valuable," or "Very Valuable." Differences between pre and post ratings were not significant, and Table 17 shows the percentages of teachers ranking each application as valuable or very valuable.

**Table 17 – CFF Teacher Post Survey Data
Most Valuable Software Tools in Order of Importance**

CFF Teacher Ratings of the Value of Software Applications	Valuable and Very Valuable POST	Very Valuable POST	Valuable POST	Don't Use POST
 Educational Management software (attendance, grades, lesson plans, etc.)	89%	61%	28%	3%
 Internet for research	80%	50%	30%	5%
 Word processing	79%	45%	34%	5%
 Email	77%	50%	27%	7%
 Presentation software (Keynote, PowerPoint)	70%	35%	35%	14%
 Multimedia reference tools (CD-ROMS, online encyclopedia)	56%	18%	38%	21%
 Other web based learning activities	48%	12%	36%	25%
 Data management (spreadsheets), graphing, or analysis software (EXCEL, SPSS, STATVIEW, etc.)	45%	11%	34%	30%
 Web based digital curriculum or curriculum resources	39%	10%	29%	34%
 Drill & practice software, integrated learning systems and/or educational games	38%	6%	32%	32%
 Video, graphics, or sound editing/production software (itunes, imovie, garage band, iDVD, movie maker)	33%	11%	22%	45%
 Desktop publishing software (PageMaker, Pages, Publisher, etc.)	30%	7%	23%	43%
 Simulations/modeling software	30%	7%	23%	47%
 Other communication tools (IM, ichtat, discussion boards, video conferencing)	26%	7%	19%	48%
 Web publishing software (Dreamweaver, iweb, etc.)	19%	4%	15%	56%
 Probeware (input devices for gathering data)	19%	4%	15%	59%
 Database software (File Maker, Access)	18%	3%	15%	52%
 Overall, how valuable are the technologies current in your class	76%	31%	45%	3%

Teachers use a variety of software applications, but what applications do students use? We asked a similar question of students, and their responses are summarized in Table 18. The pre/post responses were, for the most part, strikingly similar.

Table 18

PRE & POST TEST DATA	Never		Rarely (a few times a year)		Sometimes (once or twice a month)		Often (once or twice a week)		Almost Daily	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
Use a word processor to write a story or report	11%	11%	22%	22%	40%	39%	20%	18%	6%	8%
Use software to learn and practice skills	14%	14%	32%	28%	31%	33%	14%	14%	6%	7%
Use a spreadsheet to enter and calculate numbers or create graphs for an assignment (Excel, etc)	28%	27%	33%	29%	24%	27%	9%	9%	4%	4%
Create a database of information for a class project (FileMaker Pro, Access, etc)	39%	35%	30%	26%	20%	24%	6%	8%	3%	3%
Create a presentation and present information to classmates or others (PowerPoint, etc)	11%	11%	33%	29%	38%	38%	12%	13%	4%	5%
Communicate by email with friends, experts, and others about topics you are studying	47%	39%	20%	20%	16%	22%	9%	9%	6%	7%
Use online discussions to gather information for an assignment (discussion boards, videoconferencing, etc)	46%	39%	20%	21%	20%	24%	8%	8%	4%	4%
Conduct Internet research on an assignment topic	7%	8%	18%	18%	37%	39%	25%	21%	11%	10%
Use tools, such as graphing calculators or digital microscopes, to analyze information	17%	17%	19%	18%	23%	27%	18%	15%	21%	19%
Produce print products (with desktop publishing software)	28%	26%	27%	24%	26%	30%	11%	11%	5%	5%
Create multimedia reports or projects (with video, graphics, and sound editing)	N/A	30%	N/A	27%	N/A	27%	N/A	8%	N/A	4%
Use technology to complete a test or quiz	32%	27%	28%	27%	23%	27%	10%	10%	5%	6%

What instructional strategies are used in CFF classrooms?

CFF Classroom Observers tracked the instructional strategies used in pre and post observations, rating the "Extent to which the strategy was used during the lesson" as "none," "little," "fair amount," "most," or "all." The results, presented in Table 19, show that from the pre to the post observation period there were **significant reductions in the use of teacher lecture or demonstration and in low level, factual, teacher-led discussions.** There were **significant increases in the use of project- or problem-based learning, authentic learning, multi-modal teaching, peer teaching, and in both informal collaborative learning and collaborative learning with formal assigned roles to participants.**













Table 19

Observed Use of Instructional Strategies	Pre-Mean (N=124)	Post-Mean (N=124)	Diff	Chi2 value	p values
Teacher lecture or demonstration	2.71	2.29	-0.42	37.622	0.002*
Teacher-led discussion – low level, factual	2.43	2.24	-0.19	22.946	0.028*
Teacher-led high-level discussion w/ purposeful questions to students	2.05	2.29	0.25	9.818	0.632
Project or problem based learning	1.97	2.47	0.50	28.075	0.031*
Authentic learning	2.08	2.53	0.46	31.559	0.011*
Multi-modal teaching (ie, visual, auditory, kinesthetic)	1.81	2.14	0.34	29.431	0.021*
Peer teaching	1.53	1.87	0.33	43.674	0.000*
Collaborative learning – informal	1.93	2.25	0.31	44.406	0.000*
Collaborative learning – w/ formal roles	1.37	1.66	0.30	46.031	0.000*
WebQuests	1.09	1.24	0.15	.666	0.999
Learning centers	1.05	1.14	0.09	68.727	.000*

* Indicates a statistically significant difference

Teachers were also asked to rate instructional strategies, indicating how valuable they believed each instructional strategy was in their own classrooms, with "don't use," "not valuable," "little value," "valuable," and "very valuable" as options. Their responses are summarized in Table 20.

Table 20

CFF Teacher Ratings of the Value of Instructional Strategies	Valuable and Very Valuable POST	Very Valuable POST	Valuable POST	Don't Use POST
 Teacher lecture or demonstration	89%	28%	61%	0%
 Teacher-led discussion aimed at high-level outcomes (synthesis, evaluation, integration, application, etc.)	88%	41%	47%	1%
 Authentic learning (learning tied to the world outside the classroom)	84%	37%	47%	3%
 Teacher-led discussion aimed at factual, knowledge-level content	83%	25%	58%	1%
 Problem based learning	82%	30%	52%	3%
 Multi-modal teaching (i.e., visual, auditory, kinesthetic)	82%	37%	45%	4%
 Project based learning	75%	31%	44%	6%
 Peer teaching or peer tutoring	71%	23%	48%	7%
 Collaborative learning-informal (no formal roles assigned)	65%	20%	45%	8%
 Collaborative learning with formal roles	62%	19%	43%	13%
 <u>WebQuests</u>	34%	8%	26%	40%
 Learning centers	32%	6%	26%	43%

Do the instructional strategies used by CFF teachers appear to change in ways supported by the TPR's five researched-based domains?

Developed by faculty and students at the University of Virginia, the "Teaching Performance Record" (TPR) observation tool offers a valid, reliable method to collect information on the teaching practices of teachers and to analyze them based on factors shown to be associated with increased student achievement. The TPR describes the extent to which teachers behave in ways that influence student academic learning, involvement in classes, and motivation. After using the observation tool, administrators are presented with informative reports on the classroom practices of their teachers, as well as suggestions for post-observation conferencing, and targeted professional development plans for individual teachers and their entire faculty. For the purposes of this study, we seek to determine whether teachers engaging in the CFF program are progressing in terms of the five categories of teacher behaviors associated with enhancing student achievement: Focus/Capacity, Syntax, Principles of Reaction, Social System, and Provisions for Evaluation. Each of these categories of teacher activity is described below, in the words of CaseNEX, the developers of the instrument.

Focus/Capacity (17 items): Teachers demonstrate this attribute of Strategic Teaching when they concentrate on purpose—that is, subject matter, goals, and objectives of the lesson. They do so by addressing standards of learning, pre-assessments of students' prior learning, interests, and abilities, including their cultural and learning needs. Teachers provide the time and intellectual coherence it takes for individuals and groups to develop deep understanding of material, being careful to draw attention to big ideas as they progress. This concept also includes attention to the support system or capacity to create the conditions necessary for teaching the particular content—support such as special teaching skills and technology.

Syntax (17 Items): Teachers attend to Syntax, or the sequence of classroom events, when they plan and implement various teaching activities. This attribute of Strategic Teaching reveals itself through activities that communicate there are beginnings, middles, and ends of lessons. Teachers begin on time and transition smoothly between lesson phases. They stimulate curiosity, review previously learned material, introduce new content, integrate the new with the old, drill down on unfamiliar ideas, summarize progress, give directions for homework, provide options for learning, and the like. Because the lesson has an underlying structure of events, students can perceive a logical flow of work: "This is where we are going, this is how we will get there, this is how we will know we have arrived."

Principles of Reaction (27 items): Principles of Reaction can be thought of as the many tactics of teaching. Teachers use rules of thumb, often from moment to moment, to gauge student intellectual engagement, motivation, and frustration. These guidelines help teachers, in turn, fashion responses to what students do. Teachers ask different kinds of

questions and handle responses in myriad ways. They prompt, help, wait, restate, elicit, answer, probe, redirect, connect, reward, challenge, encourage, praise, and in other ways behave to promote desirable student performance.

Social System (25 Items): Teachers build and maintain social systems conducive to student learning by attending to roles and relationships within classrooms and by sanctioning student behavior. Teachers are friendly, supportive, helpful, and encouraging. They express expectations for behavior, build rapport, acknowledge students' feelings, communicate consequences, and praise and punish when appropriate. Their classroom routines provide opportunities to involve students in both academic and non-academic activities. In general, "social system" can be characterized in terms of teachers' efforts to create and sustain a positive social climate.

Provisions for Evaluation (25 Items): Evaluation serves both formative and summative purposes—that is for purposes of improving learning and making summary judgments about progress. Teachers demonstrate concern for evaluating students, and simultaneously judging their own teaching, in a variety of ways through their planning and interaction with students. Teachers judge student performance in relation to standards of learning, to instructional goals and objectives, and to students' needs and abilities. They set benchmarks or expectations for progress—and communicate these to students. They monitor students for involvement, interest, and participation. Teachers evaluate when they verify student understanding and provide constructive criticism. Teachers may be assessing educational progress as they monitor students' work, as they check completion of work, and as they hold students accountable for their progress. Teachers who encourage students, both collectively and individually, to reflect on what they have learned are creating opportunities to evaluate progress. "Evaluation" connotes "attaching value" to students' products and performances; to do so, teachers maintain records of progress. Teachers often evaluate learning (and their own teaching) using various types of instrumentation and different philosophical approaches.

The results from the TPR observations, including statistically significant increases in desirable teacher activities in the "Focus/Capacity" and "Provisions for Evaluation" categories are presented in Table 21.

Table 21

TPR Domain	Pre (n=234)		Post (n=236)		Mean Difference
	Mean	Std. Dev.	Mean	Std. Dev.	
Focus/Capacity	11.12	6.390	13.08	6.489	1.96**
Social System	16.21	10.892	18.14	11.878	1.93
Syntax	14.04	8.126	14.25	8.108	0.21
Principles of Reaction	21.10	15.121	23.90	15.878	2.80
Provisions for Evaluation	13.94	9.444	16.18	9.918	2.24*

* $p < .05$

** $p < .01$

Statistically significant differences were found for the domains of "Focus/Capacity" ($t= 3.286$, $p=.001$) and for "Provisions for Evaluation" ($t= 2.505$, $p=.013$). The differences exhibited for two other domains, "Social System" ($t= 1.832$, $p=.068$) and "Principles of Reaction" ($t= 1.960$, $p=.051$), approached but did not attain the level set to identify statistically significant differences (.05).

Is there a difference in the attention paid to “21st century skills” in CFF classrooms?

Teachers assessed the amount of time devoted to 21st century skills in responding to the question, "What percentage of your class time would you say is directed to the development of ‘21st century skills,’ such as creativity, problem solving, teamwork, critical thinking, and multimedia communication skills?" The responses on the pre and post surveys are summarized in Table 22 below. The differences exhibited between pre and post surveys were not statistically significantly different.

Table 22
(Percentages of Teachers)

Teacher Ratings of Time Spent in 21st Century Skills	PRE	POST	Difference
None	1	1	0
15 to 25%	33	28	-5
25% to 50%	36	39	3
50% to 75%	22	23	1
75% to 100%	9	10	1

Students were asked to assess, using a five point Likert-style item (Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree) with the statement: "My classes are helping me build skills like how to work independently, how to research online, how to work as part of a team, etc., that will help me be successful in the modern workplace. Their pre and post responses are summarized in Table 23 below. These differences between pre and post survey responses were not statistically significantly different.

Table 23
Student Perceptions: 21st Century Skills

My classes are helping me build skills like how to work independently, how to research online, how to work as part of a team, etc., that will help me be successful in the modern workplace.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	21%	25%	4%	27.956	0.110
Agree	52%	48%	-4%		
Neutral	20%	19%	-1%		
Disagree	4%	4%	0%		
Strongly Disagree	2%	2%	0%		

Our CFF observers also had a role in assessing the presence of 21st century skills. They looked specifically for 12 types listed in Table 24, and assessed their presence as "Not at All," "Somewhat," or "Substantially" visible in the lesson, or "Not Applicable" if there was a reason not to use one of the other options. "Not Applicable" responses were omitted from the analyses.

The results of this analysis (See Table 24) **show significant differences ($p < .05$) from pre to post observations in all categories of 21st century skills except "Self Direction" ($p = .557$) and Visual Literacy ($p = .058$)** which approached but did not exceed the level set to define significant differences (.05). See Appendix E for Chi2 values and probability levels.

The differences exhibited are fairly consistent, revealing a drop in the number of "not at all" ratings, an increase in the number of "somewhat" ratings, and an even larger increase in the number of "substantially" ratings, indicating that CFF teachers are, in fact, moving toward 21st century skills.

Table 24

CFF Observers' Reporting on 21st Century Skills	Not at all			Somewhat			Substantially		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
Visual Literacy	37%	21%	-16%	36%	43%	6%	15%	31%	16%
Scientific Literacy	47%	45%	-2%	15%	18%	3%	9%	18%	9%
Cultural Literacy OR Global Awareness	50%	39%	-11%	20%	28%	8%	14%	23%	9%
Teaming OR Collaboration Skills	46%	35%	-10%	23%	33%	10%	16%	24%	8%
E-Communication Skills	69%	67%	-2%	6%	13%	7%	3%	5%	2%
Social OR Personal Responsibility	50%	34%	-16%	22%	36%	15%	11%	20%	9%
Self-Direction	30%	19%	-10%	38%	43%	5%	21%	33%	12%
Creativity	49%	36%	-13%	23%	27%	3%	16%	30%	14%
Higher-Order Thinking	23%	16%	-6%	37%	31%	-6%	30%	49%	19%
Use of Real World Tools	44%	31%	-13%	32%	34%	2%	13%	29%	16%
Ability to Produce High-Quality Products	60%	44%	-16%	15%	18%	3%	10%	25%	15%
Planning, Prioritizing, and Managing Work	46%	35%	-10%	23%	27%	3%	18%	27%	9%

This concludes our look at changes in teacher activity. The next section investigates changes in student activity as a result of the CFF initiative.

Impact on Student Activity

In the section that considers CFF's impact on student activities seven questions will guide the discussion:

Has CFF changed the level of student engagement?

What is the most valuable aspect of the CFF program, for students?

What observations do key informants report about the impact that CFF has on student achievement?

Has CFF changed percentages of time students are listening, engaged in independent work or working in groups or teams?

In CFF classrooms, how much time do students spend using computers?

According to key informants, does CFF change the level of student achievement?

Does CFF change the type of products on which students' grades are based?

Has CFF changed the level of student engagement

“The single focus of CFF is student engagement,” enthusiastically claimed a high school principal during our interview. Principals, coaches, and contacts alike agreed that students are definitely more interested and engaged when in CFF classrooms. Almost 90% of Building Leaders interviewed responded favorably when asked if they had noticed any changes in student engagement as a result of the CFF program, and a similar percentage of CFF contacts responded in similar ways. When CFF coaches were asked a similar question, typical responses expressed that there is indeed more participation from students (46), that students were actively engaged and on task (15), that they were building technology skills, and (8) and that they exhibited greater levels of enthusiasm in learning (6).

Quotes culled directly from the interview analysis process perhaps better tell the story of this perceived increase in student engagement. For example, a contact told us that “one of the classes that I personally observed was an inclusion class that is probably one of the more difficult English classes. Every student in that classroom was actively involved in the lesson that the teacher had started. That would have never happened in a traditional classroom without the technology. The teacher would have struggled to have students actively engaged. I see students becoming more actively involved in learning.” Another contact expresses the sentiment in a different light, “Students are more excited to go to class. They are more involved in their learning. The classroom is more student-centered. The teachers seem really happy to have the technology and use it in the classroom because it provides different avenues for them to deliver the curriculum, and it helps differentiate the instruction and meet the different learning styles that are present in the classroom.”

A coach further echoed this positive sentiment, by stating, “even though the project was done at the beginning of the month, I saw actively engaged students updating their websites and adding comments to one another’s work. Normally, they would have done their work, tuned into the presentations of their friends and sat in the classroom for the rest of the semester. You could see the active engagement for the entire semester.” A building leader claimed that much of the impact of the program on student engagement is generated by the technology itself, “I think that student engagement due to technology keeps the kids more focused and at a pace that their brains are accustomed to. This generation really needs to have stimulation.”

Further, the kind of engagement witnessed among those who are hard to teach in traditional settings is truly remarkable. For example, a coach talked about the engagement evidenced with more challenging students explaining that, “We saw some really tough kids, some from alternative ed and lower-levels, get excited about English content, especially in writing and research, in the last marking period of the year and had fun doing it. They were always engaged. Another thing is you don’t see 100 percent engagement, no matter how good of a teacher you are, but when I walked into the CFF classrooms, there may be a lot of noise, but I saw 100 percent engagement.”

In the CFF Technology Observation dataset, we witnessed another form of evidence of increased student engagement. Our CFF technology observers were asked to estimate the engagement for the first, middle and final thirds of the class session. They were asked to estimate both the *percentage* of students engaged and their *level of* engagement, ranking their impressions of student engagement on a scale from one to five. CFF observers were given the following very specific instructions (orally and in writing) for identifying engaged students and for estimating the level of engagement they observed.

“By “engagement” we mean that students are involved in or engrossed by the learning activities and that it appears to the observer that they value the work they are doing.

Outward signs of engagement include attention, participation, focus on the task at hand, and conversation that is obviously on topic.

Signs of disengagement are inattention, attending to an alternative, off-topic activity, off-topic conversation, or misbehavior.

The easiest way to calculate the percentage of students who are engaged is to count those who are not engaged. It is easier to pick out those who are daydreaming, chatting off topic, etc., than it is to count all engaged students. In a class of 20, if I count four disengaged kids, I can set the percentage of engagement to 80%.

To establish the **level of engagement**, think about, and look for, what you would consider to be the average or typical engaged student and rate on the following scale:

1. Paying attention, but barely. Posture suggests resignation or some boredom, but student is attending. Questions are responded to, but without significant enthusiasm. If working independently, work is on topic by somewhat lackadaisical.
2. Less boredom. Posture suggests higher level of attention, but not excitement. Questions are responded to, but still somewhat casually. If working independently, work is purposeful, but lacking excitement.
3. Interest might be characterized as low-level excitement. Students are leaning forward and there is some competition to answer and contribute. If working independently, there is significant focus on the task, but still some automaticity.
4. Students are definitely engaged and interested, even excited. From comments and responses, it is evident that students value the work independently from the desire to please the teacher. There may be significant competition to respond and contribute. If working independently, focus is evident and comments occasionally reflect the pleasure of discovery or accomplishment.

5. Students are intensely engaged. If involved in group work, the impression may be one of disorder as students are unable or unwilling to contain themselves. Excitement is evident. If working independently, unsolicited comments denoting pleasure or accomplishment are common. Students share findings and successes spontaneously. Conversation is on topic and sounds surprisingly professional."

Table 25 displays the results of these observations.

Table 25

	Percentage of Students Engaged			
	PRE	POST	Change	Significance
First Third of Class	84.29	87.15	2.86	0.209
Middle Third of Class	85.87	87.24	1.37	0.688
Final Third of Class	81.62	82.07	0.45	0.986

	Level of Student Engagement			
	PRE	POST	Change	Significance
First Third of Class	2.9	3.29	0.39	0.000*
Middle Third of Class	3.12	3.37	0.25	0.044*
Final Third of Class	3.1	3.41	0.31	0.010*

While the *percentage* of students engaged doesn't seem to have significantly changed from the pre to post CFF observations, there is a statistically significant and noteworthy increase on the *level* of engagement ($t = -3.62, -2.03, -2.61$; $p < .05$ for all segments of the class).

An analysis of data from teacher and student surveys (pre and post intervention), and interviews of principals and coaches were also used to assess changes in student engagement. On the survey, teachers rated engagement using five percentage ranges shown in Table 26.

Teachers were asked to indicate which range reflected the percentage of students who were actively engaged during classes. None of the pre/post changes shown in Table 26 were statistically significant.

Table 26

Student Engagement	Percentage of Teachers Selecting Each Category		
% of Engaged Students	PRE	POST	Change
> 80%	29	29	0
61% to 80%	38	40	2
41% to 60%	23	21	-2
21% to 40%	8	6	-2
0% to 20%	2	1	-1

CFF students were asked to use a five-point Likert scale to indicate their level of agreement to the following statements:

- In this class, the topics just don't interest me, so I do just enough to get by, and no more.
- Some of the topics in my classes have been so interesting that I have done more reading or research outside of class to find out more.
- This year, my classes have been more interesting than last year.

Chi2 analysis of the responses showed no significant pre/post differences for these questions.

To summarize, an analysis of data from teacher and student surveys showed that their assessments of engagement had not markedly changed between pre and post assessments, which is consistent with what the CF observers saw in terms of the number of engaged students. However, the CFF observers reported a higher *level of* engagement among engaged students, and interviews of principals, contacts and coaches seem to substantiate this finding. These findings should also be interpreted with the fact that student engagement generally tends to drop off as the school year ends, and the post assessments were conducted near to the end of the school year.

Has CFF changed percentages of time students are listening, engaged in independent work, and working in groups or teams?

In both pre and post observations, the CFF Observers estimated, at the end of the observation, the time students had spent in the activities listed in Table 27 below.

Table 27

Activity	Percentage of Student Time Spent			t value	Significance
	PRE	POST	Change		
Listening to the teacher (in a large group setting)	36.32%	24.01%	-12.31%	4.078	p = .000
Listening to other students (in a large group setting)	11.11%	19.30%	8.19%	-3.220	p = .002
Working Independently	21.45%	22.41%	0.96%	-0.381	p = .704
Working in Groups	13.40%	18.78%	5.38%	-1.844	p = .068
Talking with the teacher in 1-to-1 or small group conversations	10.27%	11.57%	1.30%	-0.780	p = .437
Off Task (not doing what the teacher intended)	5.26%	3.02%	-2.24%	2.403	p = .018

The pre/post analysis of how CFF Observers reported students spent their time show three statistically significant differences:

- Students spent less time listening to the teacher
- Students spent more time listening to other students in large groups, and
- Students spent significantly less time "off task" (doing things other than what the teacher had intended).

These differences correspond to the finding on how teachers spend their own time (presented in Table 4 and Table 5), which revealed that teachers are spending less time lecturing and more time working with individuals and small groups.

In the next section, we investigate how teachers reported students spent their time. On the teacher survey, we asked teachers to estimate the amount of time student spent engaged in the series of activities that appear below in Tables 28-33.

Table 28 shows a significant reduction in the time teachers estimate students spend listening to lectures. The three of the five categories, which contain more than $\frac{3}{4}$ of the students showed reductions, while only one category (the highest, in which students spent 80% or more of their time listening to lectures) increased by one percent, from 7% to 8%. While this table represents a statistically significant reduction in the time teachers report students spend listening to lecture, we should bear in mind that this is still probably much higher than the CFF leaders would expect to see, and that more progress appears needed in this area.

Table 28
Listening to the Teacher (in a large group setting)

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	7%	8%	1%	39.556	0.032*
61% to 80%	20%	19%	-1%		
41% to 60%	31%	29%	-2%		
21% to 40%	28%	26%	-2%		
0% to 20%	14%	14%	0%		

Table 29 shows changes that are, overall, not statistically significant, but the 8% drop in the percentage of teachers reporting 0% to 20% of student time spent listening to other students may be worth noting.

Table 29
Listening to Other Students (in a large group setting)

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	2%	3%	1%	26.494	0.382
61% to 80%	6%	8%	2%		
41% to 60%	15%	18%	3%		
21% to 40%	38%	37%	-1%		
0% to 20%	38%	30%	-8%		

Table 30 shows insignificant pre/post changes in the amount of time teachers report students spend working independently.

Table 30
Working Independently

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	2%	3%	1%	13.408	0.971
61% to 80%	4%	7%	3%		
41% to 60%	17%	16%	-1%		
21% to 40%	46%	42%	-4%		
0% to 20%	30%	28%	-2%		

Table 31 reveals significant pre/post changes in the amount of time teachers report students spend working in groups. The table shows decreases in the categories repre-

senting lower percentages of time, and increases in the categories representing larger percentages of time, indicating that students spent more time working in groups during the post survey period than they had in the pre survey period.

Table 31
Working in Groups

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	2%	4%	2%	42.415	0.016*
61% to 80%	7%	12%	5%		
41% to 60%	20%	17%	-3%		
21% to 40%	42%	40%	-2%		
0% to 20%	27%	23%	-4%		

No significant differences were revealed by Table 32, which summarizes the pre and post survey responses indicating teachers' perceptions of the time students spent talking with the teacher in one-to-one or small group conversations. This is not consistent with what CFF observers reported

Table 32
Talking with the Teacher
in 1-to-1 or Small Group Conversations

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	2%	2%	0%	20.361	0.728
61% to 80%	3%	5%	2%		
41% to 60%	9%	10%	1%		
21% to 40%	33%	33%	0%		
0% to 20%	52%	46%	-6%		

Table 33 showed no significant differences in Off Task behavior between teacher reports during the pre and post survey periods. This is in contrast with other findings reported in the section on student engagement. One explanation for this might be the use of such large categories (spanning 20%) in the teacher survey, which may not have been sensitive enough to capture the small but significant changes observed by CFF observers reporting estimated percentages, as opposed to ranges.

Table 33
Off Task

% of Teachers

% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	1%	0%	-1%	20.056	0.633
61% to 80%	2%	2%	0%		
41% to 60%	3%	3%	0%		
21% to 40%	15%	12%	-3%		
0% to 20%	78%	80%	2%		

In CFF classrooms, how much time do students spend using computers?

At the end of each observation, the CFF observers recorded their impression of the student technology use by estimating the percentage of students who had used computers in the time categories shown in Table 34 below. **The pre/post comparison results reveal a significant reduction in the percentage of students who didn't use technology at all, and a significant increase in the percentage of students who used the computers the entire period.**

This trend is to be expected, as many classrooms received and began to use the technologies between the pre and post observations. While this finding might be considered "good news" in that the technologies that are being incorporated are increasingly being used, the numbers might also be interpreted as indicative of lower than expected technology use, given the fact that the post observations show 23% of the students in CFF classrooms did not use the computers at all during the observation.

Differences between pre and post student survey data also reveal significant changes ($p \leq .000$) in the percent change in the amount of time students report using computers from the beginning to the end of the program.

Table 34 – CFF Observer Data
Level of Student Technology Use During the Lesson

Estimate the percentage of students who actively used technology...	PRE	POST	Change	t-test	Significance
Not at all	52.46%	23.29%	-29.17%	4.928	0.000*
Briefly during the lesson	5.44%	5.69%	0.25%	-0.130	0.897
About one fourth of the period	7.30%	12.53%	5.23%	-1.436	0.154
About half of the period	6.80%	12.40%	5.60%	-1.845	0.068
About three fourths of the period	7.39%	8.65%	1.26%	-0.465	0.642
Almost the entire period	13.94%	31.64%	17.70%	-3.752	0.000*

Another source of data on student use of computers comes from the students themselves, as revealed in Table 35 below. Although the pre/post differences appear to indicate an increase in the categories representing higher percentages and a decrease in the categories representing lower percentages, that parallel the report of the CFF observers, these differences noted in the student survey approached, but did not attain a level of statistical significance (not less than .05).

Table 35
Percentage of Time Students Report Using Computers

% of Student Time	% of Students Choosing the Category			Chi2	Sig
	PRE	POST	Change		
> 80%	16%	21%	5%	30.381	0.064
61% to 80%	20%	23%	3%		
41% to 60%	21%	22%	1%		
21% to 40%	19%	17%	-2%		
0% to 20%	22%	14%	-8%		

The teacher surveys also shed light on the level of student computer use in CFF classrooms. Like the student survey data, the differences noted in teacher pre/post survey data, shown in Table 36 below, seemed to support the significant differences reported by the CFF observers, but although they approached the level determined to represent statistical significance for this evaluation, the probability value did not drop below the .05 level.

The absence of significant differences in the student and teacher surveys may reflect the late arrival of the technologies in many CFF schools, or it may be that the 20% intervals

used to separate the response categories may not have been sensitive enough to reveal smaller differences.

However, the data also point out that CFF teachers report that student use of computers is not the norm. As the Table 34 indicates, even at the post survey point, teachers estimated that almost half of the students used the computers only 20% of the time (the equivalent of one day per week) or less, and the CFF observers reported that about 40% of students used the computers 25% or less. Teachers reported that 72% of students use the computers 40% of the time or less, and CFF observers indicated that 60% of students used the computers 50% of the time or less. Comparable numbers for Year Two, during which the computers will have been in place longer, more professional development will have occurred, and teachers will have had more time to consider how to best take advantage of the technologies, could be quite different.

Table 36 – Teacher Survey Data
Using Computers

% of Teachers					
% of Student Time	PRE	POST	Change	Chi2	Sig
> 80%	3%	4%	1%	36.828	0.060
61% to 80%	4%	6%	2%		
41% to 60%	8%	14%	6%		
21% to 40%	22%	26%	4%		
0% to 20%	62%	46%	-16%		

Does CFF change the type of products on which students' grades are based?

To determine whether CFF appears to be influencing the type of products on which teachers were basing their assessments of student learning and their grades, we asked both teachers and students to estimate how much influence (by percentage) certain types of student work had on the grade in the course. Differences in the two data sources might be explained by the fact that each teacher's voice had equal weight, while the number of students representing different teachers and subjects differed. In other words, one teacher might have a class of fifteen and another might have a class of thirty. In this example, the second teacher's grading practices would have twice as much weight in students' ratings as the first. Another factor that makes comparing teacher and student responses difficult is that the response options given to teachers and students were different, making it impossible to precisely align their responses, other than by combining responses that indicate a single practice amounts to more than half of the grade. Consistently, across all types of work contributing to the grade, students seemed to attribute a higher percentage of the grade to the type of work than teachers did.

The first results described below in Tables 37 (teacher survey data) and 38 (student survey data) looks at the percentage of the student grade determined by tests and quizzes, and reported by teachers and students, respectively. On the pre survey, 40% of teachers reported that tests and quizzes accounted for more than half of the grade and students reported 60%. On the post survey, teachers reported 35% (a drop of 5%) and students reported 58%, a drop of only 2%. Neither the differences reported by teachers nor those reported by students were statistically significant, but in next year's evaluation this may change. With more time between pre and post assessments and with more time for teachers to reconsider assignments given to students as the basis for grades, we may find that these trends are expanded and that they become statistically significant differences in teaching practice.

Table 37 – Teacher Survey Data
Tests and Quizzes

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	11%	10%	-1%	23.534	0.263
51 to 75 %	29%	25%	-4%		
26 to 50%	37%	36%	-1%		
1 to 25%	22%	23%	1%		
None	1%	1%	0%		

Table 38 – Student Survey Data
Quizzes and Tests

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	20%	21%	1%	21.204	0.385
More than half of the grade	40%	37%	-3%		
About half of the grade	28%	29%	1%		
Some, but less than half of the grade	8%	8%	0%		
None or Almost None	2%	2%	0%		

The pre/post survey differences related to the importance of papers and written reports for both teachers (Table 39) and students (Table 40) were very small, and not statistically significant. Only 11% of teachers reported that papers and written reports determine more than half to the grade, as compared to 40% of students. Students were much more likely to believe that a higher percentage of their grade was determined by papers and written reports.

Table 39 – Teacher Survey Data**Papers and Written Reports**

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	2%	2%	0%	21.672	0.655
51 to 75 %	9%	9%	0%		
26 to 50%	28%	32%	4%		
1 to 25%	39%	35%	-4%		
None	21%	18%	-3%		

Table 40 – Student Survey Data**Papers and Reports**

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	14%	13%	-1%	16.969	0.655
More than half of the grade	27%	27%	0%		
About half of the grade	25%	27%	2%		
Some, but less than half of the grade	17%	16%	-1%		
None or Almost None	15%	14%	-1%		

In terms of independent work (Table 41) and projects (Table 42), teacher ratings were stable across the pre and post surveys, with 10% (pre) and 13% (post) of teachers reporting that projects comprised more than half of a student's grade (about the same percentage as for papers and written reports). About 3 times as many students (approximately 30% across pre and post) reported that independent projects accounted for more than half of their grades (See Table 43).

Table 41 – Teacher Survey Data**Working Independently**

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	3%	4%	1%	9.672	0.997
51 to 75 %	8%	9%	1%		
26 to 50%	21%	20%	-1%		
1 to 25%	55%	53%	-2%		
None	11%	10%	-1%		

Table 42 – Teacher Survey Data**Projects**

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	2%	5%	3%	28.168	0.300
51 to 75 %	8%	8%	0%		
26 to 50%	22%	26%	4%		
1 to 25%	50%	45%	-5%		
None	17%	13%	-4%		

Table 43 – Student Survey Data
Independent Projects

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	10%	11%	1%	25.107	0.197
More than half of the grade	19%	20%	1%		
About half of the grade	21%	24%	3%		
Some, but less than half of the grade	25%	21%	-4%		
None or Almost None	23%	19%	-4%		

As illustrated in Table 44, "oral reports and presentations" was the only work type for which statistically significant pre/post differences were reported by teachers, with a **significant pattern of changes indicating that more emphasis is being placed on oral reports and presentations since the introduction of CFF.**

Student perceptions of the role of oral reports and presentations in grade determination did not change significantly between the pre and post surveys.

Table 44 – Teacher Survey Data
Oral Reports and Presentations

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	1%	2%	1%	45.362	0.008*
51 to 75 %	3%	7%	4%		
26 to 50%	15%	17%	2%		
1 to 25%	48%	42%	-6%		
None	32%	27%	-5%		

Table 45 – Student Survey Data
Oral Reports or Presentations

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	7%	10%	3%	14.165	0.822
More than half of the grade	14%	15%	1%		
About half of the grade	18%	21%	3%		
Some, but less than half of the grade	24%	21%	-3%		
None or Almost None	35%	29%	-6%		

No statistically significant pre/post changes were noted in the role of class participation in grade determination, by teachers or students.

Table 46 – Teacher Survey Data**Class Participation**

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	3%	7%	4%	0.475	24.779
51 to 75 %	5%	7%	2%		
26 to 50%	14%	15%	1%		
1 to 25%	58%	53%	-5%		
None	19%	14%	-5%		

Table 47 – Student Survey Data**Class Participation**

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	8%	10%	2%	28.665	0.095
More than half of the grade	11%	12%	1%		
About half of the grade	19%	23%	4%		
Some, but less than half of the grade	44%	39%	-5%		
None or Almost None	16%	13%	-3%		

The pre/post differences in the use of group work, displayed in Tables 48 and 49, are not statistically significant. As stated above, it is possible that as students and teachers spend more time with one-to-one access to computers, the patterns exhibited, which might suggest an increase in the use of group work, may become larger and reach statistical significance.

Table 48 – Teacher Survey Data**Work Produced by Group or Team rather than Individually**

% of Grade	PRE	POST	Change	Chi2	Sig
> 75%	1%	6%	5%	26.792	0.366
51 to 75 %	4%	6%	2%		
26 to 50%	17%	16%	-1%		
1 to 25%	56%	52%	-4%		
None	21%	17%	-4%		

Table 49 – Student Survey Data
Group Projects

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	8%	9%	1%	15.383	0.754
More than half of the grade	15%	16%	1%		
About half of the grade	22%	26%	4%		
Some, but less than half of the grade	27%	24%	-3%		
None or Almost None	25%	20%	-5%		

This CFF evaluation also sought to understand whether student work was changing in terms of the intended audience for the work. The questions asked to discern this (asked of students only) are shown in Tables 50 and 51 below. The differences shown are not statistically significant.

Table 50 – Student Survey Data
Work that is simply handed in and graded by the teachers

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	17%	17%	0%	24.156	0.236
More than half of the grade	23%	21%	-2%		
About half of the grade	24%	26%	2%		
Some, but less than half of the grade	27%	25%	-2%		
None or Almost None	7%	7%	0%		

Table 51 – Student Survey Data
Work that is shared in a meaningful way with an audience outside the classroom

% of Grade	PRE	POST	Change	Chi2	Sig
All or almost all of the grade	6%	8%	2%	20.845	0.406
More than half of the grade	9%	12%	3%		
About half of the grade	14%	18%	4%		
Some, but less than half of the grade	19%	18%	-1%		
None or Almost None	50%	41%	-9%		

What do CFF principals, coaches, and contacts predict about the impact of CFF on student achievement?

Although it is still early in the implementation of CFF, and we agreed not to investigate changes in student achievement in a formal way in year one, our interviews did ask

principals, coaches and contacts if they had seen things they believed would be indicative of increased student achievement. Several of the people we interviewed were eager to report observations they believe to be advances in student achievement.

One coach noted, “We received a CPS unit (clickers) and found that a lot of special ed students who scored low, scored higher when using the technology. We related it to a prior year and the grades went up 25%. It has really helped with lower level and special ed students.”

Among principals interviewed, more than twice as many report changes in student achievement compared to those who report felt that it was too early to say whether there are changes in student achievement, and the results from coaches and contacts were similar.

Coaches consistently reported that students are excited, but teacher and student survey data on student engagement are somewhat at odds with these reports. However, we should remember that coaches were describing individual events, while teachers and students were describing interest and engagement over long periods of time. Although it has not been tested, one would expect a positive relationship between level of student engagement and student achievement, so it will be important to track this through subsequent years.

Impact on Teacher’s Attitudes

Because teacher attitudes are important "early indicators" of how a significant change is going, and because building leaders can use information on attitudes to steer program implementation, this formative assessment investigated teacher attitudes from the perspective of the following eleven questions:

- Do teachers' opinions about the potential value of technology in their classrooms change during their CFF experience?
- Do teachers and key informants believe that the quality of the learning experience they offer has increased as a result of CFF?
- Do teachers believe student learning has increased as a result of CFF?
- Does CFF change the type of work they assign and the quality of work they expect from students?
- Do teachers develop more technology-related skills and feel better prepared to teach using technology?
- Do teachers believe that they are working longer or harder as a result of CFF?
- Does CFF change the way teachers feel about teaching as a profession?
- How important do teachers believe the CFF Coaches to be in the success of CFF?
- Which of the CFF Coach responsibilities do the teachers perceive as most important?

- How important do teachers believe the building Principal has been in the success of CFF?
- Which of the Building Principal's contributions do the teachers perceive as most important?

Each of these questions is discussed in turn, in the pages below.

Do teachers' opinions about the potential value of technology in their classrooms change during their CFF experience?

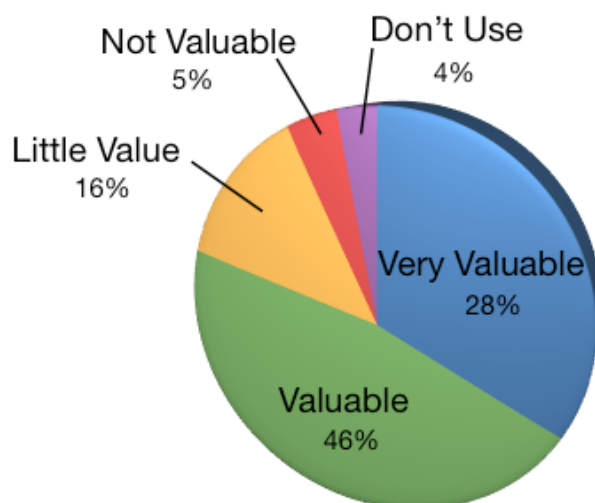
While there appear to be small increases in the value teachers attribute to technology between pre and post teacher survey reports, the results ($\chi^2 = 35.587$, $p = 0.078$) approach, but do not reach the level determined as representing statistical significance ($p < .05$).

As reported in Table 52 and illustrated in Figure 3 below, 74% of teachers find the technologies in their classrooms either "valuable" or "very valuable," while 4% of teachers don't use the technologies and 5% report it to be "not valuable." While the percentages of teachers who do not use the technologies in their classrooms may be troubling, given the significant investment made, it should be remembered that in several schools the technology had been implemented very late in the school year, and there had been little time for teachers to infuse the technology into the ongoing assignments already in place or to make major modifications to classroom procedures.

Table 52 – Teacher Survey Data
Value of the Technology in the Classroom

	PRE	POST	Change	Chi2	Sig
Very Valuable	28%	32%	4%	35.587	0.078
Valuable	46%	46%	0%		
Little Value	16%	13%	-3%		
Not Valuable	5%	4%	-1%		
Don't Use	4%	3%	-1%		

Figure 3
Teachers' Perceptions of the Value of Technologies in Their Classrooms



In order to gain insight into whether teachers feel that the impact of CFF will be long lasting, and/or whether they might feel that impacts might be greater in the future (for example after teachers' skills in incorporating technologies have matured or as the technologies themselves evolve), we asked teachers to predict how the changes might be perceived when they looked back on the changes ten years from now. The pre/post analysis of what teachers think about the future contribution of technology in their subject yielded statistically significant differences ($p=.003$) but the aggregate results appear to indicate a drop in the "very significant" category (3% decrease) and an increase in the "significant" category (2% increase). Based on the data available we really can't interpret the reasons behind this finding.

Table 53 – Teacher Survey Data
Value of the Technology in the Future

When we look back on the progress made in teaching your subject ten years from now, the contribution of technologies will be seen as...	PRE	POST	Change	Chi2	Sig
Very Significant	40%	37%	-3%	50.938	0.003*
Significant	40%	42%	2%		
Moderate	15%	15%	0%		
Marginal	3%	3%	0%		
Minimal	1%	1%	0%		

Do teachers believe that the quality of the learning experience they offer has increased as a result of CFF?

Although the pre/post differences displayed in Table 54 below were not significant, they may represent preliminary evidence that teachers feel that the quality of learning experiences is improving. The percent changes for all teachers show decreases in the categories representing lower quality (Poor: -2%, OK: -1%, Good: -3%).

Table 54
Quality of Learning Experience

Given the tools and resources available to me, the learning experience I can offer students in my classroom is...	PRE	POST	Change	Chi2	Sig
Excellent	23%	28%	5%	21.354	0.673
Very Good	41%	42%	1%		
Good	22%	19%	-3%		
OK	9%	8%	-1%		
Poor	3%	1%	-2%		

These preliminary trends, although not statistically significant, were echoed in interviews with contacts, principals and coaches. In contrast to the mixed responses in the survey data, key stakeholders interviewed for the CFF evaluation responded with overwhelmingly positive responses. When asked whether the CFF initiative changed the nature of the learning environment, district contacts in particular responded positively. A sizable number of responses from district contacts indicated that the quality of the learning experience in CFF classrooms has increased. CFF, according to one district contact, “is about changing the way teaching and learning happens in a high school classroom and trying to shift the teaching modalities from a teacher-centered environment, that is relatively low tech to a student-centered environment using technology.” A small minority of responses reported that it was too early to tell and/or that the quality of the learning experience was already high prior to the intervention. The following response from a district contact is typical, “I would say that if anything the content may be the same but the depth and some of the discussion that came out of discussions was remarkable. The ability of students to participate more in discussions and to be more actively involved really drives that freedom for them and the comfort level for them in the classroom.” Such markers of a change in the learning experience indicate how key informants believe that instruction is increasingly becoming differentiated and student centered.

These messages are echoed by the building principals’ sentiments. A similar number of principals claimed that the quality of the learning experience has increased as a result of the CFF initiative. Smaller percentages noted either that it was too early to tell or that CFF remarkably increase the level of the differentiation of instruction in pilot classrooms. This last point is highlighted by one principal, “I would say that moving from traditional instructional strategies to more student centered activities were up a measurable percentage. If I would have to guess, out of the teachers who are part of the CFF initiative, compared to how much they were doing last year with technology, we have probably tripled that. If we were at 15% using it last year, we are probably now

around 45 percent. We are also moving to student-centered activities in the classroom using technology.” This response is typical and marks how key stakeholders view that not only the breadth, but also the intensity of the learning experience is increasing in CFF classrooms.

Does CFF change the quality of work they expect from students?

It has been proposed that when technologies are available, teachers' expectations for quality work from students will increase. Table 55 below shows pre and post teacher survey data, on this question. The differences exhibited are not statistically significant.

Table 55
Expectations for Quality of Student Work

I can expect work of the highest quality from our students.	PRE	POST	Change	Chi2	Sig
Strongly Agree	20%	25%	5%	17.005	0.997
Agree	38%	40%	2%		
Somewhat Agree	29%	26%	-3%		
Somewhat Disagree	9%	5%	-4%		
Disagree	3%	2%	-1%		
Strongly Disagree	0%	1%	1%		

These findings, although not statistically significant, appear to echo those regarding student learning, which would imply that as students are learning more teachers may come to expect higher quality work.

Throughout the interview data set, a sizable number of respondents noted the increasing amount of differentiated instruction. One student remarked to a respondent, “I used to tolerate Chemistry, now I like being in class because of the projects.” According to another coach, “teachers’ attitudes about technology are changing and teachers’ attitudes about letting students be active participants in the learning process have changed.” This focus on increasingly involving students in different kinds of activity calls for a change in the kind of products expected of students, according to these anecdotal accounts.

Do teachers develop more technology-related skills and feel better prepared to teach using technology?

While there were no statistically significant differences between pre and post survey data for either of the two questions designed to investigate how well prepared teachers feel they are to take advantage of the CFF technologies, the data reported convey very important information for leaders of the CFF initiative.

As indicated in Table 56 below, on the pre surveys, only 45% of teachers agreed or strongly agreed that they had the technology skills they needed to teach their subjects using the best methods available. On the post surveys that number had risen to 52%. About 12% of CFF teachers either disagreed or strongly disagreed on the pre survey as compared to 9% on the post survey, and when those who disagreed or strongly disagreed are combined with those who "somewhat disagreed" or "somewhat agreed", we can see that about half of the teachers (55% at the time of the pre survey and 48% at the time of the post survey) feel less than comfortable with their level of technology preparation, a fact that points out the need for continuing, effective, professional development.

Table 56
Teachers Ratings of Their Own Tech Skills

I have the technology skills I need to teach my subject using the best methods available.	PRE	POST	Change	Chi2	Sig
Strongly Agree	16%	16%	0%	33.971	0.565
Agree	29%	36%	7%		
Somewhat Agree	30%	28%	-2%		
Somewhat Disagree	13%	11%	-2%		
Disagree	7%	6%	-1%		
Strongly Disagree	5%	3%	-2%		

The discomfort discussed above is interesting in combination with the data reported in Table 57 below, which indicates that about 70% of the CFF teachers feel better prepared to teach than they did the previous year. They feel discomfort about their current level of technology skill development compared to where they feel they should be, but they also feel they are better prepared to teach than in the previous year. One possible explanation of this might be that they have learned what teaching in their subject area can be, and they see that they are not yet there. It is not uncommon for people to feel less well prepared as they learn new things. The phrase "they don't know what they don't know" is often used to describe people who feel capable or knowledgeable because they have mastered what they believe to be the key elements of a field, when in fact the reality is simply that there is more to it than they realize. Perhaps as CFF teachers learn new skills and see new opportunities to convey the skills and knowledge in their content areas, they realize that they have more to learn – that they are better prepared *and* that they have more to learn.

Table 57
Teachers: Better Prepared to Teach than Last Year?

I feel better prepared to teach than I did last year.	PRE	POST	Change	Chi2	Sig
Strongly Agree	31%	31%	0%	29.87	0.754
Agree	38%	41%	3%		
Somewhat Agree	19%	19%	0%		
Somewhat Disagree	7%	4%	-3%		
Disagree	3%	3%	0%		
Strongly Disagree	1%	1%	0%		

The principals and CFF coaches interviewed for this evaluation further offer positive remarks about teacher risk-taking that has come about as a result of the CFF initiative. Coaches' remarks when asked whether teachers are willing to try to use technology in their practice are mostly positive, saying that teachers are willing to try new things, that the support the coach offers allows teachers to take new risks, and that even reluctant teachers are taking risks after witnessing the value of the technology. Principals' responses seemingly echo the findings from the coaches. Some divergences occurred in less frequent, but still prominent remarks. For example, a few principals remarked that they have noticed that older teachers are teaching differently, that teachers' selected to pilot the CFF initiative were selected since they were already risk takers, and that as with any comprehensive school reform initiative it is necessary to put people in a non-threatening environment to encourage them to use what they have learned.

On the whole, such observations highlight the overwhelmingly positive response of key stakeholders, coaches, principals, and district contacts, when asked about the impact that CFF has had on teachers' attitudes and practice. Indeed, many of the people interviewed have remarked that despite the implementation delays, that the CFF program has a structure that enables it to succeed, specifically remarking on the combination of a comprehensive technological initiative, just-in-time professional development, and a vision to implement a long term, comprehensive high school reform initiative. Such comments testify to the fact that not only has the CFF mission and message effectively spread throughout the pilot districts, but also that this mission is being accepted with open arms by most of these pioneer stakeholders.

<p><i>Do teachers believe that they are working longer or harder as a result of CFF?</i></p>

A recurring theme when talking to teachers who work in schools or classrooms in which every student has a computer, is that they are working harder and longer than before, but that they would not go back to teaching without the technologies despite the higher workload.

Tables 58 and 59 report the responses to our questions asked to investigate whether CFF teachers were also experiencing this change in workload. The results indicate that 69%

of CFF teachers agreed or strongly agreed that they are working harder than in past years, and 73% chose the same categories on the post survey. Although these pre/post differences were not statistically significant, they do indicate that the vast majority (90% if "somewhat agree" responses are included) feel that they are working harder than in past years. The fact that some of the CFF equipment had been installed and some of the professional development had been done prior to the pre survey, may partially explain the high pre survey numbers, but it is also likely that other factors such as NCLB pressures and increasing class sizes may also have been involved.

Table 58
Teachers Working Harder?

I am working HARDER than I have in past years.	PRE	POST	Change	Chi2	Sig
Strongly Agree	35%	39%	4%	24.643	0.924
Agree	34%	34%	0%		
Somewhat Agree	20%	17%	-3%		
Somewhat Disagree	6%	6%	0%		
Disagree	3%	2%	-1%		
Strongly Disagree	1%	1%	0%		

Sixty-one percent of pre survey respondents and 65% of post survey respondents agreed or strongly agreed that they are working longer than in past years. The pre/post differences for the question about working longer came extremely close to attaining statistical significance ($p = 0.051 > 0.05$). It appears safe to assume that a change has taken place between the pre and post surveys, and that that change reflects a trend away from other categories and toward the "strongly agree" category.

So, CFF teachers report that they are working longer and harder than in past years, a position that is supported by the interview data gathered from CFF coaches, principals, and contacts.

Table 59
Teachers: Working Longer?

I am working LONGER than I have in past years.	PRE	POST	Change	Chi2	Sig
Strongly Agree	30%	35%	5%	50.938	0.051
Agree	31%	30%	-1%		
Somewhat Agree	22%	21%	-1%		
Somewhat Disagree	10%	8%	-2%		
Disagree	5%	3%	-2%		
Strongly Disagree	1%	1%	0%		

"Teachers are working better. The technology has provided them with the opportunity to work smarter and more efficiently," remarked one CFF principal. Principals noted that teachers are both working longer and harder, and some claimed they were "working smarter" as well. One principal reported:

“Oh, my teachers are so excited. Every one who has it in their classroom thinks it’s fantastic. I see them working longer hours, they are putting in more time at the school. They are engaged very heavily in professional development. I see them walking across the hall and asking their friend, “Hey, how do you do this, what did you learn there?” and actually pushing each other, while before they seemed to exist only in the classroom. Now, the students are the same way. I see they are impressed because they see the teachers engaged and excited, and as a result of that they are also excited.”

Not a single response from principals indicated that teachers were not working either longer or harder. Indeed, the majority of responses focused on how teachers are doing both, with smaller number focusing on how teachers are working smarter, harder, or longer.

Another concept that was observed by all three interview groups was called "a ripple effect." There were reports of teachers without the equipment and training seeing what teachers in the program are doing and want to do it too. One contact said “I think the initial response has spread like wildfire across the rest of the school and therefore we have a group of people eager to start next year’s program.”

Does CFF change the way teachers feel about teaching as a profession?

Although teachers are working longer and harder than in past years, the very small (statistically insignificant) pre/post changes exhibited in Table 60 below indicate that teachers' attitudes toward teaching as a profession have remained quite stable, with approximately 54% of teachers responding to the post survey reporting that they would recommend teaching as a profession.

Table 60

Teacher Feelings about Teaching as a Profession

I would recommend teaching to a friend considering entering the profession.	PRE	POST	Change	Chi2	Sig
Strongly Agree	18%	19%	1%	29.838	0.756
Agree	34%	35%	1%		
Somewhat Agree	25%	25%	0%		
Somewhat Disagree	11%	9%	-2%		
Disagree	7%	5%	-2%		
Strongly Disagree	5%	6%	1%		

The Importance of the Coach, the Principal, and Professional Development

A significant difference between Pennsylvania's Classrooms for the Future initiative and other one-to-one initiatives and reform initiatives is the presence of the coach, described more thoroughly in Appendix C. In this section we look at the importance of the CFF Coach and the Building Principal, and the associated professional development they provide and promote.

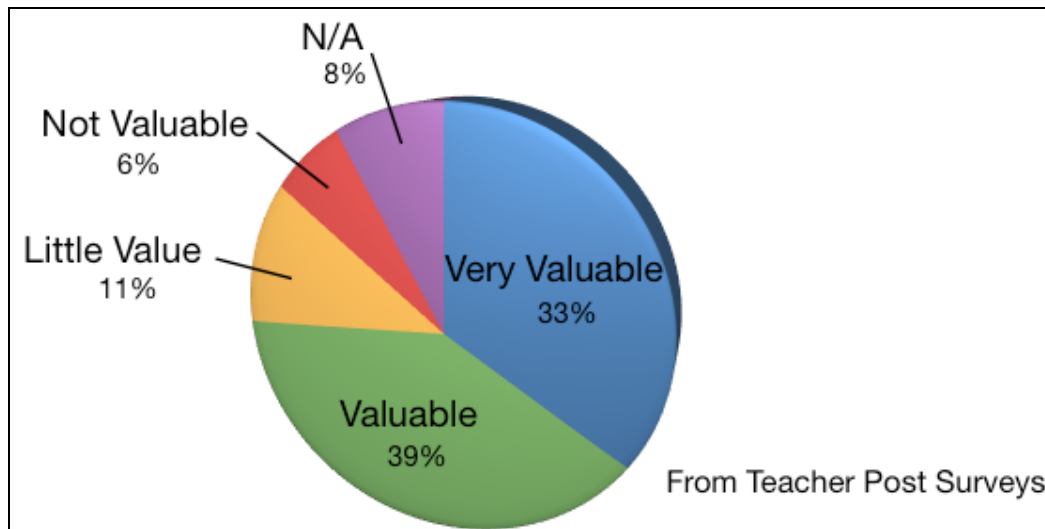
How important do teachers believe the CFF coaches to be in the success of CFF?

At the time of the CFF pre survey, 64% of CFF teachers reported their services to be either valuable (32%) or very valuable (also 32%). By the time of the post survey, these numbers had increased to 72%, an 8% increase. Despite the fact that these and the other shifts listed in Table 61 were not statistically significant, it is also worth noting that 12 of the 20% who had replied N/A on the pre survey had formed perceptions of their coach's value.

Table 61
Value of the the CFF Coach

Overall, how important is the CFF Coach to the success of your school's CFF effort?	PRE	POST	Change	Chi2	Sig
Very Valuable	32%	33%	1%	28.268	0.296
Valuable	32%	39%	7%		
Little Value	10%	11%	1%		
Not Valuable	4%	6%	2%		
N/A	20%	8%	-12%		

Figure 4
Perceived Value of the Coach (from Teacher Post Surveys)



From a qualitative standpoint, coaches, principals and contacts alike reported that the professional development and the coach were the most valuable aspects of the CFF program for teachers. The presence of a coach, they reported, actively involves the faculty in changing their teaching. Among the comments that stressed the importance of teacher training was one from a contact who told us, “Obviously, [the most important aspect of CFF] would be the guidance that the coach is providing. A major part of it is the coach providing some of the guidance and the professional development as well: In some respects, the out-of-the-box training. The teacher has to have a feel and comfort level with using the technologies, but once you get past the basic nuts and bolts you have the chance to think and work creatively to develop those types of lessons.”

They reported that the CFF professional development for teachers, provided by the coaches, allows one-to-one time, and real support, so that the teachers can increase their skills in such a way that they are empowered and they have a positive attitude toward the change. Another by-product of the professional development, they reported, is a new level of discourse among teachers about instructional strategies and outcomes. When asked about important impacts of the program, one contact described this discourse, saying, “I think the dialogue that has been created among the teachers about what kids really need to move forward. Just to get teachers to talk to each other about what is important.”

Furthermore, the presence of a coach appears to actively involve the faculty in changing their teaching styles. A by-product of the coaches' activities and the professional development is a new level of discourse among teachers about instructional strategies and outcomes. When asked about important impacts of the program, one contact described this discourse saying, “I think the dialogue that has been created among the teachers about what kids really need to move forward. Just to get teachers to talk to each other about what is important.”

According to many, the coach is the cornerstone of the success of the program. One principal reiterates this point, “I really can’t take credit for anything other than meeting with her weekly. She has been phenomenal. She is the reason the whole thing is blossoming.” Overall, coaches feel that the teachers are responding positively to them though many were reluctant to trust them in the beginning. “Overall, it is a good, receptive feeling that I get from teachers” claims one coach. On the whole the responses from coaches indicate that coaches believe that teachers are happy to have access to the support of a professional who can supply experience, ideas, and some technical support. According to one coach, “they now realize that I am not a threat. I can’t solve all of the tech issues but I can get results for tech issues cleared up quickly. I can also solve some smaller problems for them and they appreciate that help.”

Which of the CFF coach responsibilities do the teachers perceive as most important?

The role of the coach is multi-faceted, containing the primary responsibilities listed in Table 62 and more. We asked teachers how valuable each of these roles was and present their responses in Table 62 as an ordered list, based on their combined "valuable" and "very valuable" responses to the pre survey. The second numerical column shows the comparable combined rankings from the post survey, which had not changed much. It is important to note that the question was worded in a way that asks teachers to report how important these activities "have been" to them, and not how valuable they now are. This gives us a picture of which activities have had value, but not necessarily those that are now perceived as most important as they move ahead with CFF.

Table 62

Teacher Perceptions of the Value of Coaching Activities

Indicate how valuable each of the various activities performed by the Classrooms for the Future Coaches have been to you. If your coach does not provide a particular type of service, select "N/A."	PRE Value Ranking (1= Highest Ranking)	POST Value Ranking (1= Highest Ranking)	PRE "Valuable" + "Very Valuable"	PRE "Very Valuable"	PRE "Valuable"	POST "Valuable" + "Very Valuable"	POST "Very Valuable"	POST "Valuable"
♦ Teaching me to operate computers, networks, or software programs	1	1	57%	21%	36%	63%	24%	39%
♦ Suggesting ways to incorporate technology to teach the content in my classes	2	1	56%	22%	34%	63%	23%	40%
♦ Solving technical problems (Printer won't print, network is down, etc.)	3	4	54%	24%	30%	55%	25%	30%
♦ Leading CFF-related professional development workshops	4	3	51%	20%	31%	56%	21%	35%
♦ Helping me think about how to assess technology-rich lessons	5	5	38%	13%	25%	46%	16%	30%
♦ Advising me on how to use technology through a differentiated instruction approach to meet individual student needs	6	6	37%	13%	24%	42%	14%	28%
♦ Observing my instruction and providing feedback	7	7	33%	10%	23%	35%	13%	22%
♦ Teaching demonstration lessons in my classroom	8	8	28%	11%	17%	32%	12%	20%

“The difference the coach made is that everyone made progress” claims one district contact. Consistently, the most important role of a coach appears to be suggesting ways to incorporate technology to teach the content in my classes and increasingly make lessons more student centered. According to one principal, “working side-by-side in the classroom with teachers developing lessons” is the coach's focal role. Another principal highlights how, “the professional development helps teachers to grow and plan student-centered lessons without a judgmental concern.” Indeed nearly all of the responses from the principals interviewed focused on how the coaches have helped the implementation of CFF. The remainder of the responses focused on how it was too early to tell. Of the positive responses, some focused specifically on the role of peer-to-peer training was vital for the school level success of the initiative. Many others claimed that the program would not be effective without the coach. When probed further on this note, many principals and district contacts claim that working directly with the teacher, being available to meet teachers’ needs, and working as an advocate for teachers in the implementation process are the most important identifiable coaching responsibilities. As if summarizing these responses, one principal remarked, “Our coach is absolutely wonderful. Our coach has been extremely supportive, extremely visible, has done personalized sessions with both teachers, and myself and the coach actually comes into the individual classrooms to see how she can assist further. She is very supportive.”

The coaches’ themselves have shared numerous insights into the challenges of the coaches’ role, successful strategies of coaches’, and advice for future coaches. According to many coaches, it is a challenge to help teachers shift from teacher-based to student-based instruction with competency and content (not necessarily technology). Another challenge coaches’ face is achieving teachers’ buy-in building ownership of this particular high school reform process, and balancing time to support many teachers. One coach highlights this last point in the following matter, “my most challenging aspect of my role of a coach has been managing the time between all of the teachers (...) I am responsible for the training and facilitation of 60 teachers. Juggling time and resources is a major challenge for me. Other coaches’ further expressed frustration with technical issues, social conflicts between coaches’ and teachers, and the necessity of working within school schedules that don’t allow for much professional development.

“The way I did the professional development made the teachers feel comfortable,” claimed one coach. While facing these challenges, on the whole coaches believe that communication, sharing of ideas, differentiating training for teachers, working one-on-one with teachers, and integrating technology into the curriculum, are some of the strategies practiced by successful coaches. Another coach claims, “The most powerful part of this program is looking at how we teach and reflect. I provided teachers a way to reflect on their own practice.” Additional comments about the role of the coach and its challenges are described in Appendix C.

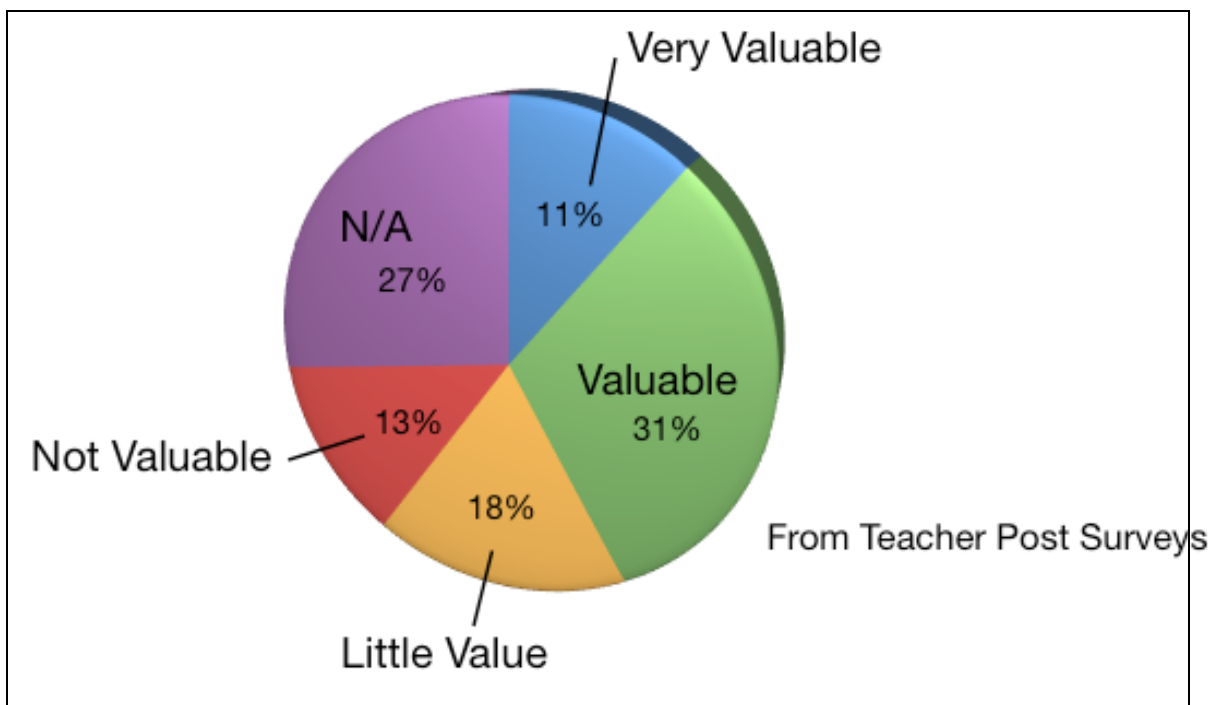
<i>How important do teachers believe the building Principal has been in the success of CFF?</i>
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CFF principals play many important roles in the leadership of their high schools, and as depicted in Table 63, their role in the CFF program was perceived as valuable or very valuable by 38% of teachers in the pre surveys and 42% in the post surveys.

Table 63
Value of the the CFF Principal

Overall, how important is your building principal to the success of your school's CFF effort?	PRE	POST	Change	Chi2	Sig
Very Valuable	10%	11%	1%	20.094	0.742
Valuable	28%	31%	3%		
Little Value	15%	18%	3%		
Not Valuable	11%	13%	2%		
N/A	35%	27%	-8%		

Figure 5
Teachers Perceptions of the Value of the Principal – Post Survey Data



“The administrator has been a staunch supporter and it was her vision to make the high school as forward thinking and technology literate as possible (...) She has been a driving force,” claimed one district contact. Very few coaches, and not a single district contact, reported that the principal has hindered the success of the CFF program at the school level. Indeed the most frequent observed comment by district contacts focused on how the building principal was flexible, facilitative, and supportive. The remainder of the re-

sponses from district contacts focused on how the principal was both an advocate for the program among faculty and other administrators and further was an essential part of the implementation by making the CFF a priority in their classrooms. Summing this sentiment up, one district contact stated “Our leadership has been instrumental in making it very clear to teachers that this is an important initiative and moving into a new direction. Differentiated instruction and project-based learning is going to happen. Their leadership is essential.”

Most coaches note that the administrator has been personally involved in monitoring the implementation of CFF. The most frequently proffered description is that principals help when they can, given other commitments. Many principals were the ones who helped win the designation of their school as a CFF pilot school. In such cases, the administrator is often viewed as an advocate both within the school and beyond its walls. Within the school, principals help by increasing teacher buy in, providing substitutes, fostering communication, etc. Outside the school's walls the principal works both with other schools and with district personnel in order to further the mandate of the initiative. This aspect of the administrators’ work garners numerous praises, such as the following from a CFF Coach: “The pilot school administrator was exceptional at promoting this and she was instrumental in helping to get the program going. As we worked through the layers of individuals with influence within other schools, their support was also invaluable.”

Which of the Building Principal’s contributions do the teachers perceive as most important?

As shown in Table 64, by far, the most important role the teachers ascribed to principals was that of observing the teachers instruction and providing feedback, which more than twice as many teachers cited as valuable or very valuable than any other activity.

Table 64
Teacher Perceptions of the Value of Principal Activities

Indicate how valuable each of the various activities performed by the Classrooms for the Future Coaches have been to you. If your coach does not provide a particular type of service, select "N/A."	PRE Value Ranking (1= Highest Ranking)	POST Value Ranking (1= Highest Ranking)	PRE "Valuable" + "Very Valuable"	PRE "Very Valuable"	PRE "Valuable"	POST "Valuable" + "Very Valuable"	POST "Very Valuable"	POST "Valuable"
✦ Observing my instruction and providing feedback	1	1	47%	13%	34%	46%	13%	33%
✦ Suggesting ways to incorporate technology to teach the content in my classes	2	2	23%	4%	19%	26%	6%	20%
✦ Advising me on how to use technology through a differentiated instruction approach to meet individual student needs	3	3	18%	3%	15%	24%	6%	18%
✦ Helping me think about how to assess technology-rich lessons	3	4	18%	3%	15%	23%	5%	18%
✦ Teaching demonstration lessons in my classroom	5	5	9%	2%	7%	14%	4%	10%

An additional valuable commentary arises from principals when they describe their own effective leadership strategies and offer advice to the next cohort of CFF administrators.

Being involved, supportive, and understanding are the most frequent recommendations that Cohort 1 principals have to offer. One principal uses the following strategy: “Regular meetings, team support, the communications, and my open door policy all make it easy for CFF not to be perceived as a risk.”

Other frequently offered suggestions include the importance of modeling technology, placing CFF as a priority on the principals’ agenda, and further creating a model of shared governance with the CFF program. Summarizing this sentiment, one principal describes his leadership priority: “I think it is critical as a principal that I also model the use of technology and it’s important for teachers to embrace it and also for students to embrace it.” Finally a small portion of principals’ responses focused on the need for principals to understand the implementation process, the need to keep track of CFF events and changes to the program, and further all the responsibilities that participation in the initiative entails. Interviewed in early June, one principal offered the following comment and advice: “Hopefully it will be funded for the second go-around. Principals should prepare to put in a lot of extra time. They should also have a lot of patience and model a good attitude.”

Impact on Student Attitudes

Because student attitudes play a very important role in student achievement, the contributors to the design of this evaluation wanted to monitor how students feel as well as how teachers feel. Specifically, we wanted to know:

- Do students believe that the quality of the learning experience offered has increased as a result of CFF?
- Do students' opinions about the value of school change as a result of their CFF experience?
- Does student interest increase in math, science, language arts or social science?
- Does CFF influence students' perceptions of their preparation for college and for life after school?
- Does CFF influence students' interest in teaching as a career?
- Do students believe that they are working longer or harder b/c CFF?

Since students are the best source of information on how students feel, the research team decided to rely principally on evidence from student surveys (pre and post) to address these questions. However, as mentioned earlier in this report, the period during which the CFF program was actually up and running in many schools may not have been long enough to assess changes that develop over time, so the findings shared here may not be similar to those that emerge from the second year of the program, which will result in a much longer exposure to the technologies and the new forms of teaching and learning that they enable.

Do students believe that the quality of the learning experience offered has increased as a result of CFF?

As shown in Table 23 above, seventy three percent of CFF students agreed or strongly agreed with the statement: "My classes are helping me build skills like how to work independently, how to research online, how to work as part of a team, etc., that will help me be successful in the modern workplace." While four percent more students strongly agreed with that statement at the post survey stage, this difference was not statistically significant.

In addition to the messages arising from the survey data, the interview data that focuses on changes in the quality of the learning experience for students is, on the whole, optimistic. CFF is "a highly spirited approach to learning, students are engaged, teachers are highly interactive. Smarter kids as well as others are responding to intellectual challenges," reports one principal. On the other hand, a few coaches noted that there was some resistance from students who lacked technology skills. Other students believed that

participating in CFF classrooms meant that they had to work harder. Yet, the majority of responses that the coaches offered focused on how student attitudes have changed for the better. According to one coach, "There is a change in student attitude. They enjoy working with the technology and teachers seem to be reenergized with this new concept so it is infectious with the students and keeps them engaged in what they should be learning." Two themes resonate: how technology motivates and spreads. Many respondents note the intrinsic appeal of the technology. For example, one principal notes, "Kids are used to technology and the amount of time kids spend using technology as a part of their lives is more than most people are aware of so making it real in the classroom makes it more important."

Furthermore, some respondents claim that CFF is "spreading like wildfire" or is "infectious." Another coach recounts that a student told her, "I wish we had more opportunities to think this way." This quote draws a sharp contrast between traditional instruction and the kind of delivery witnessed in CFF classrooms. A district contact noted how "students are more excited to go to class. They are more involved in their learning. The classroom is more student-centered." In doing so, she proposed a link between changes in student attitudes that had resulted from a change in the classroom environment. In essence, most respondents reported that students are excited about the program, that the classroom atmosphere is energized, that more active learning is occurring, and that students appear more motivated.

<p><i>Do students' opinions about the value of school change as a result of their CFF experience?</i></p>
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Three questions from the student survey are used as evidence in answering this question: a question about students' pride in their schools (see Table 65 below), a question about students level of excitement about school (see Table 66 below), and a question about their level of effort in this school year as compared to previous years (see Table 67 below).

Although reports of change in students' school pride appear to be quite small, they did attain the level determined to represent statistical significance in this evaluation ($X^2 = 42.852$, $p=.002$). However, the change was not characterized by an increase in the percentages of students reporting in the higher categories, but rather the difference was caused by decreases in the lower response categories and an increase in the percentage reporting their pride as neutral.

Table 65**Student Perceptions: Pride in School**

I am proud of my school.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	17%	17%	0%	42.852	0.002
Agree	30%	30%	0%		
Neutral	31%	33%	2%		
Disagree	10%	9%	-1%		
Strongly Disagree	11%	10%	-1%		

As shown in Table 66 below, the differences between the pre and post surveys in terms of the students' level of excitement were not statistically significant, but, given the short duration of the CFF presence in the schools and the fact that students attitudes are known to drop at the end of a school year, these insignificant differences in a favorable direction may be harbingers of larger differences in future examinations of this factor. (And, it may be that this item was worded too extremely to get a reasonable response from high school students – that high school students may be unlikely to feel or to admit to being "excited about going to school." Perhaps having 27% agree or strongly agree with this statement at this time of year is a laudable accomplishment!)

Table 66**Student Perceptions: Excitement about School**

I get excited about going to school.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	7%	9%	2%	24.649	0.215
Agree	15%	18%	3%		
Neutral	36%	37%	1%		
Disagree	20%	16%	-4%		
Strongly Disagree	20%	17%	-3%		

Table 67 below indicates that there was no significant difference between pre and post survey responses in terms of the level of effort students reported.

Table 67**Student Perceptions: Level of Effort**

I put more effort into school this year.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	18%	19%	1%	17.996	0.588
Agree	34%	30%	-4%		
Neutral	29%	31%	2%		
Disagree	11%	11%	0%		
Strongly Disagree	6%	6%	0%		

Although none of the interview questions focused specifically on the variation in student perceptions of the value of school, many of the comments touched on this theme. "These

kids are not only more involved and more excited, but they have also become leaders in the classrooms,” enthusiastically claimed one district contact. Many respondents reported a link they perceived between increased student engagement and students' attitudes toward school. And, as stated earlier, another district contact claimed that all people in the school were feeling a sense of pride.

Does student interest in math, science, language arts, and social studies increase as a result of CFF?

As illustrated in Tables 68 through 71 below, students attitudes toward their content areas did not increase during this relatively brief exposure to CFF technologies, in language arts, math, science nor social studies.

Table 68
Student Interest in
Reading / English / Language Arts

Rate your interest in the content area:	PRE	POST	Change	Chi2	Significance
The most highly interested	15%	18%	3%	28.305	0.102
Highly interested	16%	16%	0%		
Interested	26%	27%	1%		
A little interested	24%	21%	-3%		
Not at all interested	17%	15%	-2%		

Table 69
Student Interest in
Math

Rate your interest in the content area:	PRE	POST	Change	Chi2	Significance
The most highly interested	16%	16%	0%	29.121	0.085
Highly interested	18%	18%	0%		
Interested	24%	25%	1%		
A little interested	19%	18%	-1%		
Not at all interested	21%	20%	-1%		

Table 70
Student Interest in
Science

Rate your interest in the content area:	PRE	POST	Change	Chi2	Significance
The most highly interested	20%	20%	0%	17.975	0.589
Highly interested	21%	20%	-1%		
Interested	25%	26%	1%		
A little interested	18%	17%	-1%		
Not at all interested	15%	15%	0%		

Table 71
Student Interest in
Social Studies

Rate your interest in the content area:	PRE	POST	Change	Chi2	Significance
The most highly interested	19%	19%	0%	9.828	0.971
Highly interested	20%	20%	0%		
Interested	25%	26%	1%		
A little interested	18%	17%	-1%		
Not at all interested	16%	15%	-1%		

Does CFF influence students' perceptions of their preparation for college and for life after school?

As indicated in Tables 72 through 74 below, students' brief exposure to CFF did not appear to have a significant impact on student perceptions about their confidence about their lives after school, their preparation for the "real world," or the relevance of their classes to their adult lives. However, approximately 56% of students agreed or strongly agreed that compared to the beginning of the year, they felt more confident about life after high school, 54% felt that their technology skills were ready for the "real world," and 50% agreed or strongly agreed that the work they were doing in their classes would be useful in the jobs they hope to have as an adult.

Table 72
Student Perceptions: Confidence about Life After High School

Compared to the beginning of this year, I feel more confident about life after High School.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	20%	20%	0%	16.025	0.715
Agree	37%	36%	-1%		
Neutral	29%	31%	2%		
Disagree	8%	7%	-1%		
Strongly Disagree	4%	4%	0%		

Table 73**Student Perceptions: Tech Skills for the Real World**

I feel ready for the real world, with reference to my technology skills.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	19%	20%	1%	27.882	0.112
Agree	35%	34%	-1%		
Neutral	31%	33%	2%		
Disagree	10%	8%	-2%		
Strongly Disagree	4%	4%	0%		

Table 74**Student Perceptions: Relevance of Classes to Adult Life**

The work I am doing in my classes will be useful to me in the job I hope to have as an adult.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	18%	17%	-1%	14.606	0.798
Agree	33%	33%	0%		
Neutral	29%	32%	3%		
Disagree	12%	10%	-2%		
Strongly Disagree	6%	6%	0%		

Does CFF influence students' interest in teaching as a career?

Only about 30% of the CF high school students had thought about becoming a teacher, and CFF did not appear to influence their thinking in this respect. Only about 26% of students feel that teaching math or science would be fun.

Table 75**Student Perceptions: Teaching as a Career**

I have often thought about becoming a teacher.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	11%	13%	2%	16.837	0.664
Agree	14%	17%	3%		
Neutral	19%	22%	3%		
Disagree	21%	18%	-3%		
Strongly Disagree	34%	28%	-6%		

Table 76**Student Perceptions: Teaching Math or Science**

I think teaching math or science would be fun.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	8%	10%	2%	14.062	0.827
Agree	14%	16%	2%		
Neutral	20%	23%	3%		
Disagree	21%	18%	-3%		
Strongly Disagree	35%	30%	-5%		

Although the differences were not statistically significant, the direction of the movement between pre and post surveys might be considered favorable, with the percentage of disagreement and strong disagreement that teaching science or math could be fun declining and the percentage of agreement and strong agreement increasing, and the same pattern emerging in the percentages of students who had thought of teaching as a career.

Do students believe that they are working longer or harder as a result of CFF?

Table 77 below reveals differences that approach but do not quite attain the desired level indicating statistical significance. The movement indicated by the small changes in Table 77 indicate that there may be movement away from disagreeing that school is challenging.

Table 77**Student Perceptions: Level of Challenge**

I feel challenged at this school.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	11%	11%	0%	30.226	0.066
Agree	31%	31%	0%		
Neutral	35%	37%	2%		
Disagree	13%	11%	-2%		
Strongly Disagree	8%	8%	0%		

The difference in attitudes toward hard work and its ability to determine success (Table 78) was not statistically significant, nor were the changes shown in Table 79 about the relevance of class work to jobs in adult life.

Table 78**Student Perceptions: Hard Work and Success**

I feel that if I work hard I can be successful in my classes.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	43%	38%	-5%	20.729	0.413
Agree	37%	34%	-3%		
Neutral	13%	18%	5%		
Disagree	3%	3%	0%		
Strongly Disagree	2%	4%	2%		

Table 79**Student Perceptions: Relevance of Classes to Adult Life**

In my classes, a lot of time is spent answering questions from a book or worksheet.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	13%	14%	1%	27.465	0.123
Agree	36%	35%	-1%		
Neutral	35%	35%	0%		
Disagree	11%	10%	-1%		
Strongly Disagree	3%	4%	1%		

The changes reported in perceived workload by students between pre and post surveys (See Table 80) were not statistically significant.

Table 80**Student Perceptions: Workload**

The amount and rigor of class work my teacher assigns is pretty typical of other classes I have taken.	PRE	POST	Difference	Chi2	Sig
Strongly Agree	9%	12%	3%	16.766	0.668
Agree	39%	36%	-3%		
Neutral	37%	39%	2%		
Disagree	9%	7%	-2%		
Strongly Disagree	4%	4%	0%		

Factors that may be Limiting Program Impact

The section considers mediating factors, based on two broad questions about what might be limiting CFF's potential impact

- What technology-related problems might be limiting the program's impact?
- What people or system problems might be limiting the program's impact?

We begin this discussion by drawing on themes that emerged from our interview data. When asked if there were any implementation issues, responses from district contacts centered around two conclusions: 1) the equipment that arrived didn't work well, and 2) the timeline for implementation was too short, especially for the professional development component.

Typical responses from CFF coaches are summed up in the following, "On the PC side there has been dissatisfaction with the laptops themselves. They seem to be slow. Perceived by the students as being old and clumsy, they have seen the Macs, which are slick and cool. There seems to be some competition between them." On the other side of the coin, another CFF coach claimed, "We switched to Macs and our tech staff needed some help." Overall, the majority of the responses in our dataset provided 'constructive criticism' to the CFF program at the state level as can be seen in this quote: "I think Holly Jobe should be commended for what she has done for the program. It was a championship effort. One thing which is a downside is that the schools are restricted as to what they can buy and lots of folks were not really happy with the hardware that they received."













Regarding the second point, a district contact further expanded this perspective, claiming that not only was the timeline too short, there is also the need in year two to work around district schedules and union agreements. Recounting one source of tension, a CFF coach commented, "The union was concerned that I was going to be doing data collection but that was resolved. They were also concerned about people being asked to do work beyond the contract." Another commonly expressed comment from coaches was, "There is little flexibility in this school to free up space or teachers for training." Conversely, a CFF coach credits the time delay as allowing for extra planning time, "We prepared really ahead of time, thinking ahead about how we wanted to structure it and how to integrate with our current infrastructure."

<i>What technology-related problems are experienced that might limit the program's impact?</i>

Teachers' pre and post survey responses revealed only small (statistically insignificant) changes in the magnitude of the problems they faced. As illustrated in Table 81 below,

the primary problems faced by teachers were predictable, although their relative importance of these may be surprising: inadequate professional development, computer failures, and network downtime. Based on our conversations with Coaches, Contacts, and Principals, we feel that the survey item labeled "inadequate professional development," which was use intact from a validated instrument, may be misinterpreted. All voices seem to indicate that the professional development teachers received as part of the CFF program was quite good. We believe that this item might better have been labeled "insufficient" professional development. We also believe that the more teachers know about technology the more they want to do with it, which has implications in that as teachers learn more, they see new opportunities and want to know still more, making the *need for* professional development a predictable byproduct *of* effective professional development.

Table 81: Teacher Perceptions of Implementation Issues

CFF Teacher Perceptions of the Magnitude of Various Implementation Issues	No Problem	Small Problem	Problem	Significant Problem	Huge Problem	Problem Total	Problem Rank
 Inadequate Professional Development	36%	22%	18%	9%	9%	36%	1
 Computer Failures	20%	39%	17%	13%	5%	35%	2
 Network Downtime	27%	35%	17%	11%	5%	33%	3
 Printing Problems	36%	30%	13%	8%	6%	27%	4
 Plagiarism	53%	18%	12%	5%	5%	22%	5
 Lack of Technical Support	51%	22%	10%	6%	4%	20%	6
 Electronic White Board Board Problems	44%	29%	11%	5%	3%	19%	7
 Battery Issues	54%	25%	8%	4%	3%	15%	8
 Projector Problems	57%	22%	7%	4%	2%	13%	9
 Sound Problems	60%	27%	7%	3%	2%	12%	10
 Theft	77%	7%	4%	2%	2%	8%	11
 Vandalism	75%	9%	4%	2%	2%	8%	11

The issue of maintenance of computers and networks is a significant challenge as a school moves to one-to-one computer access for students, and it would be logical to predict that the time required to get a computer repaired might increase as the number of computers to be serviced increases, but according to student survey data, computer repair response times actually got significantly better between the pre and post survey periods (see Table 82 below), while neither network downtime (see Table 83) nor time required for software-related assistance (see Table 84) changed significantly.

Table 82

Student Perceptions: Computer Downtime

How long does it take to get a failed computer repaired?	PRE	POST	Change	Chi2	Sig
1/2 Hour to 1 Hour	17%	19%	2%	47.956	0.020*
1 to 3 Hours	17%	17%	0%		
1/2 Day to 1 Day	21%	24%	3%		
2 to 5 Days	22%	19%	-3%		
1 to 3 weeks	11%	9%	-2%		
A Month or More	9%	9%	0%		

Table 83

Student Perceptions: Network Downtime

How long does it take to get network services restored when the network goes down?	PRE	POST	Change	Chi2	Sig
1/2 Hour to 1 Hour	22%	23%	1%	23.759	0.783
1 to 3 Hours	24%	23%	-1%		
1/2 Day to 1 Day	28%	27%	-1%		
2 to 5 Days	13%	13%	0%		
1 to 3 weeks	5%	4%	-1%		
A Month or More	5%	6%	1%		

Table 84

Student Perceptions: Help for Software Problems

How long does it take to get help on a software problem or question?	PRE	POST	Change	Chi2	Sig
1/2 Hour to 1 Hour	49%	44%	-5%	26.638	0.642
1 to 3 Hours	17%	17%	0%		
1/2 Day to 1 Day	14%	17%	3%		
2 to 5 Days	8%	8%	0%		
1 to 3 weeks	3%	3%	0%		
A Month or More	5%	6%	1%		

We can also draw important insights on this topic from our interview data. Some of the most frequent observations related to technology factors that are limiting the impact of the program include: the blocking of educationally rich websites; the lack of funding for technical support; printers and servers not working properly; limited bandwidth at the school; battery recharging issues; and memory issues (despite the fact that the district

paid for extra capacity). An illustrative observation about these infrastructure issues is provided by one coach who reported, “The infrastructure problems that I mentioned before delayed our launch a little bit, but taking care of the electric properly prior to getting started I think was the right decision.”

Coaches also report irritation with such implementation issues as the late arrival of the laptops and the difficulty of finding time for the PDE-sponsored training and professional development. District contacts respond to these concerns by addressing what they’d do differently during the second year of implementation. Among the themes offered by these contacts are: plan on receiving the equipment sooner; find ways to provide more technical support; and offer additional training and plan professional development opportunities specifically to address challenges presented by the technology.

<i>What people or system problems might be limiting the program’s impact?</i>
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The reports of principals, contacts and coaches are consistent with the survey data supplied by teachers, indicating that theft, vandalism, and lost computers, are not major issues limiting CFF’s impact. Themes that arise from the Coaches’ data set reveals the following issues: problems with spreading the message about the CFF initiative (many people didn’t understand the importance of the program); the late arrival of the laptops and corresponding absence of accountability for the PC providers; the professional development focusing specifically on technological issues, although important, often conflicts with school-level scheduling and the school-level focus and importance placed on achieving NCLB benchmarks.

All of these issues hint at the importance of enhancing communication about the purposes of the program, enhancing the professional development component, and improving the partnership with computer vendors. These communication issues occur on two levels, within the district and externally to it. An example of these communications issues is seen in a fragment from an interview with a CFF Coach, who explained, “We are not in control of the money and how it is being used, so the interpretation for professional development has been interpreted differently than what was presented to us by the state. Because of that difference at the district administration level I think that has caused a problem getting the equipment here.” In order to remedy this perceived lack of communication, one district contact suggests, “The best advice that I can give is just to be immersed in everything that is provided for CFF in terms of collaboration, professional development, and the connections you can make with other districts and administrators.”

One recurring theme throughout the interviews that should come through loud and clear in this section on "system variables" moderating the effectiveness of the program, is the paramount importance attributed to the coach. The coach, as a dedicated proponent of the changes the reform is designed to promote, as a professional educator with significant experience at the high school level, and as a trusted member of the school's faculty, is in a

unique position to ensure that the investment in the technologies and professional development is not lost. The stories of coaches leading teachers to effective use of the CFF technologies are numerous and impressive, and, according to those interviewed and to the teachers as well, the coaches are making crucial contributions that should bear fruit in the future.

Conclusion

It is still very early in the CFF initiative, but the initial signs indicate that all involved understand that CFF is about new approaches to teaching and learning, and not about the technology. There is evidence that changes are underway, in the anticipated direction and in areas that are normally quite resistant to change. These changes encompass how teachers teach, what teachers teach, what teachers ask students to do, and what students do. The year two evaluation will follow these trends over a longer period, and will also investigate effects on student learning.

Appendix A

CFF Program Description

<i>Why and how was CFF created?</i>
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CFF is a comprehensive high school education reform effort that seeks to create a technology infrastructure and learning community that enable, promote, and support 21st century teaching and learning. In creating and sustaining this initiative, Pennsylvania's leaders seek to change schools to meet the needs of students by providing instruction grounded in rigor and relevance while giving them experience with the tools they need to compete in the 21st Century, simultaneously preparing Pennsylvania's younger citizens for both college and careers in the Commonwealth. In short, CFF was created in order to enhance the ability of Pennsylvania and its' citizens to compete both nationally and globally.

No longer a 'rust belt' state, Pennsylvania strives to be a leader in the field of technology. Through programs such as Classrooms for the Future, the state hopes to create a well-educated and prepared citizenry that will use their 21st Century Skills to lead the nation in innovation. This linkage between economic growth and educational productivity is a key strategy in the effort to enhance Pennsylvania's national competitiveness as the current administration seeks to foster linkages between industry and the future members of the workforce in new and dynamic ways. Additionally, there is a renewed emphasis on enhanced technological skill sets, aiming Pennsylvania's sights further, pushing the state to become prominent as a global economic power in the near future. Finally, a program such as CFF allows Pennsylvania's younger citizens the chance to be increasingly prepared for the kind of technology-based marketplace that policy makers dream of spreading across the State. As one CFF Coach claims, "CFF gives students in high school hope that they will be able to get jobs in the future. At least with technology, they know there are many jobs out there that are technology laden and now these kids can compete for these jobs."

Governor Rendell describes the CFF high school reform initiative in the following manner, "Classrooms for the Future will not only help to boost achievement while our students are still in high school, but they will be primed for success in college and beyond, especially in fields that require advanced skills with computers and technology. If we are to adequately prepare our students to effectively compete in the global marketplace, we must transform how they learn and how teachers teach." According to Michael Golden, too many of Pennsylvania high schools are outmoded and outdated, the administrators of these schools are not prepared as leaders in organizational, instructional, and strategic thinking. Finally, high schools commonly do not address the 21st Century tools and skills that students exercise everyday throughout the Commonwealth. CFF further enables teachers to use technology as an effective tool for

instruction and learning. It seeks to create ‘smart’ classrooms with effective resources and instructional delivery strategies. In doing so, the CFF initiative recognizes and embraces the need for educational reform while understanding the role of technology as a change agent. When asked what issue(s) could CFF help solve in their school, one CFF Coach responded, “I don’t think it solved anything. I think the program provides a new vision, it refreshes teachers who’ve been out of college for awhile, helps them recognize there’s a new way of learning and how to connect that way with students, but it didn’t solve anything.”

There is another reason why CFF is integral to the reforms that Governor Rendell has in mind for Pennsylvania’s educational system. CFF seeks to create learning environments that student will find engaging and will pique their interest. Changes in student attitudes in CFF Classrooms have been reported to be both positive and intense. One teacher reported, “the availability to have the technology at your fingertips within the classroom totally changes the ability to work beyond the walls of the classroom and globalize learning. The CFF program affords student and teachers the opportunity to see that the classroom is just the launch pad for learning. It is not just a secular environment where everything takes place and things don’t stay in a particular room.”

The Challenge

CFF is a chief initiative of Governor Rendell. As such, much of the mandate for the program lies in the Governor’s vision and his collaboration with the legislative branch for approval and direction on priorities for the program. Funding for this initiative is dependent on the annual review of the Governor’s budget proposals by the legislature. Such budgetary processes involve contentious congressional debate. In addition, some school districts fear that when they have to replace or upgrade the laptops the funding will not be available. Despite these obstacles, CFF did achieve its funding targets for both Year One and Year Two. It will be important for to evaluate the results of the program and to determine any positive impacts that increased technology use in instruction has on both students’ ability to learn and their preparedness to enter the 21st Century workforce. Legislators and others must be able to understand how this initiative will positively influence Pennsylvania’s future.

<i>What is CFF?</i>

As the CFF program began, one expected to encounter a variety of perspectives about the program from diverse audiences around the state. Nonetheless, our interview respondents representing an array of CFF coaches, principals, and district contacts presented strikingly similar messages and observations when asked the question, “What is CFF?”

The responses from our interviews of CFF principals, coaches, and contacts generally relay three interrelated themes that define the Classrooms for the Future program. Many

interview respondents claim that CFF is a state initiative that seeks to put a laptop on the desk of every student so that student achievement is increased in a world where the students are expected to globally compete. Others claim that CFF is about improving instruction so that teachers can teach those skills that enable success in the 21st Century. These 21st century skills will help prepare students for the future so that current schooling is relevant and meaningful to their lives. Finally, the remaining responses to our interviews generally focus on how CFF provides professional development for teachers through mentoring experiences, resources, and support so that they can effectively use technology in the classroom.

Responses from CFF Principals

Principals strongly believe that the initiative permits districts to increase technology in the classroom, encourages teachers and students to use 21st Century teaching and learning skills, and focuses on changing the methods of instruction to make learning more student-centered. Some claim that CFF increases the efficiency of the learning process, and many principals believe that both the professional development component and the focus on moving beyond traditional methods of instruction are important school level issues that the program addresses.

Even when responding that CFF brings additional resources into schools, most principals focus on such equity related issues as improving student access to computers in underprivileged environment. One principal remarks, “I think the single issue that CFF solves in our school is the lack of student access.” Other remarks focus on the importance of professional development. When asked about the single most important focus of the CFF program, one principal resolutely responded, “the coach. Every other grant we have seen before was missing the implementation component.” The focus on implementation and training teachers to use technology is what makes the CFF program unique.

There was some criticism about the manner in which CFF emerged in Year One. A vocal minority of principals consistently reported that, “PDE needs better timing and advanced notice for meetings and requirements. Trainings and days required for teachers should be scheduled with school calendars.” Although this kind of criticism was found in all three interview data sets there were relatively few negative comments about the program.

When asked about the advice a principal would give to a colleague implementing CFF in the first year one remarked, “Hopefully it will be funded for the second go around. Prepare yourself to put in a lot of extra time. Have a lot of patience and keep a good attitude while you are doing it.”

Responses from CFF Coaches

The common themes from interviews with the coaches focus on the following: the push to provide equal access to technology for all students; providing teachers with professional development opportunities and personal support; fostering higher levels of

thinking among students; and classrooms that are student-centered and that prepare students for the future. “CFF is about moving all teachers and students into the 21st century by integrating technology into the classroom,” one coach responded. A district contact further expanded this theme by describing that “there are two valuable aspects [to the program]. One is access to the technology and the way that it has modernized the classroom. The second thing is the professional development that is provided as a support mechanism for teachers.”

This focus addresses both the efficiency and the equity concerns of the program. This efficiency concern is seen in a May 24, 2007 article in the Pittsburgh Post-Gazette that reports, “The program’s school level administrator, Mr. Brian Stamford, noted that the teachers’ comfort levels with the kind of technological jumps they have to make in their classrooms will determine the efficiency of all the new gadgets.” Yet according to some coaches this efficiency dynamic is being played out in the manner expected, “In the short time that the laptops have been in place, there has been a change in the kind of lesson preparation. This change is taking place more quickly than I thought. There is greater one-on-one shift of instructional strategies attending to what that student is doing, solving student concerns, and bringing students to higher levels of understanding.”

CFF also addresses equity concerns. “It levels the playing field for all students. All students’ don’t have access to the same technology in school and out of school. Not all students have access to the Internet or computers once they leave the building,” says Central York School Board President Eric Wolfgang. Further, a sizable number of district contacts that we interviewed mentioned that the main emphasis of the program is to provide access for students in districts that do not have the resources to initiate the projects on their own. Describing how one district is encountering this digital divide using the CFF resources, one district contact describes, “We are a small rural school district and relatively poor. We know that we have a lot of students who don’t have access to technology on a regular basis outside of the school. This enables us to give them the opportunity to work with, to learn from, and on technology on a regular basis in the classroom.”

Another aspect of the digital divide reportedly being resolved by the CFF program is usage. Importance is placed on what the technology is being used for, as seen in this fragment of an interview with a CFF Coach, “It is really about changing instruction to make it more meaningful and to make sure students have the skills that they are going to need in the 21st century, and, introducing more technology into the classroom in order to make high school more relevant. Help students understand that what they are learning now is important whenever they leave high school. We help them see the world and prepare.” Two of the most common themes that CFF Coaches mention during the interviews are the goal to increase student engagement and to foster student motivation. As a result, some claim that CFF helps student persist in their education as seen in a fragment culled from the Pittsburgh Post-Gazette, “Mr. Zahorchak pointed to two state programs that address the challenge of engaging students and giving them a reason to stay in school. Those are Project 720, named for the number of school days in four years

of high school, and Classrooms for the Future, an initiative that will give all students a laptop computer.”

Responses from CFF District Contacts

When asked what the CFF program is about, the majority of responses from among the district contacts interviewed commented on how CFF expands and supports effective use of the technology once it is in place. According to these district contacts, this high school reform initiative is about changing the way that teachers design and support instruction. According to one district contact, “the number one problem or issue is to make a technologically literate teacher and to help them find ways to integrate the technologies better in the classroom.

A sizable number of district contacts also report that the teacher support provided by the program, specifically by the CFF Coach, is a focal part of the program. One district contact claims, “the most valuable aspect of the program is the sheer amount of professional development that they are getting out of it.” Coaches and principals agree. Two of the most common themes of the coaches’ dataset are that the primary purpose of CFF is to support teacher training and to aid teachers in the process of integrating 21st century skills into instructional practice. This support of the way teachers design instructional practice is reportedly geared towards preparing students for the 21st century, using technology to prepare students to exercise 21st Century skills. Another district contact reported that by integrating 21st Century skills into instructional practice, teachers “are using technology for more collaborative thinking such as working with others to develop projects, working with students in other districts or around the world.”

By exercising these 21st Century skills, the program focuses on enhancing student achievement and helping students become independent learners. “The focus of CFF would be connecting and motivating students. Students are interacting more with the teaching going on in the classroom and collaborating more with each other. We have seen a lot of pretty amazing things happen even though we have only been set up in five classrooms since March,” reports one district contact about how CFF is transforming classrooms to become more student centered.

What is the timetable for continued implementation?

Three broad areas of concern were identified from the experience of Year One implementation: the lateness of the implementation, equipment issues, and resistance from teachers. Strategies for planning for Year Two implementation were also collected.

Late Implementation

Across most interviews, respondents describe strikingly similar issues with the first year implementation and challenges they (or others) will face in future years of the

implementation of the CFF initiative. The most prominent theme focused on the delay in the implementation itself. Describing this challenge, one CFF Coach reported, “The laptops came in rather late, around the middle to the end of March. Then our technician had to put specific images on. Before he could do that he had to work with the company to get the CD. It delayed being able to get the laptops in the teachers’ hands into mid-April. They have only really had access to them the past six or seven weeks. The plan for next year is to have enough funding to have at least ten or fifteen carts of laptops. If they get the laptops for student use, they are hoping to bring on fifteen to twenty more teachers. We are hoping to grow exponentially.” Echoing this concern, one district contact claims, “the most challenging aspect of the program, I think, was the implementation of the equipment and getting it configured to interact with the technology already here.”

As reported by district contacts and principals, there are additional ‘time’ related concerns. The most frequently cited challenge is finding time for professional development for teachers. According to one principal, coordination and communication are the biggest challenge of the implementation of the CFF program: “PDE needs better timing and advanced notice for meetings and requirements. Training and days required for teachers must be scheduled with school calendars.” Third, broadening the theme of communication issues, many district contacts and principals cite poor communication with PDE and constant changes in what is expected from districts and teachers.

Equipment Issues

Dealing with such issues as antiquated technological infrastructure and in general prepping and delivering the equipment in a timely manner was a frequently mentioned challenge of the CFF program. The CFF program is both a blessing and a curse for those schools with antiquated equipment. One CFF Coach reported, “We have a resource problem. We are not a wealthy school district and our computer labs are pretty much antiquated. We don’t have access for all teachers.” Further, one district contact expanded on this theme, reporting, “the most challenging aspect, I think, was the implementation of the equipment and getting it configured to interact with the technology we already have.” On the whole, perhaps the loudest criticism about the technology itself is the strain that it puts on the district’s own resources. According to one Coach, “We have four techs for 21 schools. In Year One we ordered teacher laptops (142) but in year two we will have 3000 machines. This will strain our four technicians. We are looking to add more technicians. I would have thought that in an initiative of this size there would have been some funding for tech support.”

Resistance from Teachers

Resistance was reported, in teachers who were reported to have a mindset against change and were not risk takers. One principal addressed this theme by describing a non-threatening environment they were trying to create, saying, “We are fully aware that there may be times when something they try may not work out but we are not holding them accountable if it doesn’t work as long as they learn from their mistakes.” Indeed, a

supportive climate of innovation is suggested by many of the district contacts and principals. One principal describes the supportive climate that has been implemented in the school as a result of CFF, “Allowing teachers the flexibility to try new things, encouraging them to do new practices instructionally. Providing opportunities to share (is important).” On the whole, despite initial perceptions of teachers’ resistance to the program, principals, district contacts, and CFF Coaches alike report that this resistance has abated. Summarizing this dynamic, one district contact reported, “every teacher involved in this has taken more risks than they have in the past. They have all stepped out of the comfort zone at some point. This is the source of a lot of the contention (...) Nonetheless, every teacher has done something new as part of this project.”

Planning for Year Two

District contacts make four general observations on what they plan to do differently in Year Two. First, some district contact plan on providing additional training to support the integration of technology into the curriculum. District officials also had to effectively communicate the requirements of the professional training to teachers and had to further account for existing union contracts. On the whole, district contacts and principals described that the most effective professional development component consisted of the activism and support of the CFF Coach. Some the coaches focal duties are helping teachers become more comfortable with the technology and more able to integrate the technology into innovative practices.”

A large portion of the responses from district contacts related to for professional development opportunities. The second most frequently observed statement calls attention to the need for district administrators to lobby all parties to work to receive the equipment sooner. Third, a vocal minority of responses called attention to the need to promote greater accountability and effectiveness by all personnel in the district, including themselves. Finally, an infrequent, but still important observation by a small number of respondents focused on the need to provide the students computers, since in Year One only their teachers had received them.

Appendix B

Methodology

This evaluation rests upon the foundation of the data that is collected throughout the various stages of the Classrooms for the Future program. Largely, this data is collected by district personnel (CFF Data Collectors) who have been charged by their district to both organize the process of the CFF teacher and student surveys at the district level as well as conduct observations of four teachers using two different, but complementary, instruments. It is the strength of this foundation, of the efforts of the CFF Data Collectors as well as the district level incentives and motivations provided in compliance with the requirements of the CFF program, that the success of the overall evaluation is most aptly measured.

The primary charges of the CFF Evaluation Team are twofold: 1) facilitate data collection efforts, 2) analyze the data and report the findings. Only with the interview dataset does the team directly collect data. The team further does little actual management of the data. Rather, it is an analysis team of professionals from several higher education institutions. Their research protocol and research questions were developed in collaboration with the Pennsylvania Department of Education. In the matrix developed through this collaborative effort, there were a number of research questions that each measure to designed to answer.

In this Appendix, we touch on four different measures that have informed our analysis, describing in detail the methods by which the data were collected, analyzed, and reported. The following summary of our methods is divided into four sections reflecting the four primary forms of data collection: The CFF Technology Observation, the CFF teacher and student surveys, the Teaching in Pennsylvania Record, and the interviews with CFF personnel.

The CFF Technology Observation

The CFF Technology Observation is targeted to answer the following research questions and substantially validate the self-reported data gathered from the CFF teacher and student surveys,

- 1) What is the impact of CFF on Teaching Practice?
- 2) What is the impact of CFF on Student Activities?

This observation tool was based upon a protocol developed for the State Educational Technology Directors Association (SETDA) suite of tools. This observation protocol was developed in concert with the survey instruments described below and was used in the same four phases of field trails. The protocol was administered by trained district personal and was conducted during similar periods of observation as the Teaching in Pennsylvania Record (TPR). In each school district, a CFF Data Collector was charged

with conducting 2 observations (one during the pre ‘window’ and the second during the post ‘window’) for each of two teachers randomly selected by the research team.

During Year One, the Pre Window lasted from February 2, 2007 through March 30, 2007. The post window was open between May 7, 2007 and June 1, 2007. This yielded an overall treatment window of approximately five weeks. During the pre window, 235 observations were sent to the Casenex team, the team that actually gathers the data offered by the CFF Data Collectors. During the post window 186 observations were collected. Of these observations (n=421), 248 observations occurred in 124 "matched pairs" – representing the same teacher, observed two times, and falling within the required windows.

The CFF observation itself consists of nine different categories of items that the CFF Data Collector observes. These are:

- 1) Learning Environment
- 2) Teacher Activity
- 3) Level of Student Engagement
- 4) Instructional Practices
- 5) Post Instruction Wrap-up
- 6) Student Work Products
- 7) Classroom Management and Teacher Comfort level
- 8) Percentage of Student Activity
- 9) 21st Century Skills

The Learning Environment Category consists of two parts, access to technology and organization of the classroom. Specifically, observers are asked to record the technology available for use, and not its actual use.

Teacher activity was described for each third of the class time, the beginning, the middle and the end of the session.

The student engagement category focuses on how students are involved in or engrossed by the learning they are doing and how valuable they seem to find this learning.

The instructional strategies characteristics are complexity (that corresponds to a scale such as Bloom's Taxonomy), Instructional Style (from didactic to constructivist), and authenticity (does the lesson have real word context). The Post Instruction Wrap-up gauges how well the teacher ends the lesson. Student work products looks at the lesson's goals through the products that are produced. Classroom Management and Teacher Comfort level are paired. Specifically ‘Teacher Comfort Level’ refers to how comfortable the teachers appear to be in the new technology-rich environment. Finally, the percentage of student activity and 21st Century Skills are relatively self-explanatory. The 21st Century Skills examines whether teachers provide instruction or employ strategies to develop these skills.

The Statistical Package for the Social Sciences (SPSS) version 15 was used to analyze the data and to determine the statistical significance of the differences exhibited between the pre and post observation periods. After generating initial findings, including frequencies, percentages, and means) and verifying with the CFF Evaluation Team Co-Directors how the data was to be managed and presented, the researchers then ran the Pearson Chi-Square and independent T-test analyses for each research question, as appropriate. The Pearson Chi-squares were used to assess the significance of differences between pre and post intervention data when the data represented categorical variables, while an independent t-test analysis was conducted to look for differences between continuous dependent and independent variables. An alpha level of .05 was used to indicate statistical significance for all questions.

Survey Methodology

The CFF Surveys are designed to investigate changes in the perspectives and self-reported activities of teachers and students between a 'pre' window and a 'post' window. The research protocol for the surveys is based on answering each of the five main research questions that the CFF Survey was designed to answer. These research questions are:

- 1) What is the impact of the CFF initiative on teaching practice?
- 2) What is the impact of the CFF initiative on student activity?
- 3) What is the impact of the CFF initiative on teacher attitudes?
- 4) What is the impact of the CFF of the CFF initiative student attitudes?
- 5) What are the factors that might be enhancing or limiting the initiative's impact?

The Classrooms for the future teacher and student surveys were central instruments used in this research study. The instrument's items have been used in previous surveys at Penn State and beyond spanning thousands of respondents and were developed, piloted and revised over a number of years by the Metiri Group for the State Educational Technology Directors' Association (SETDA).

The CFF Evaluation's population was all CFF teachers and one class of students taught by each teacher in the Classrooms for the Future program in Pennsylvania. The simple heuristic is that if a teacher or student is impacted in any ways by CFF funding, then they are indeed CFF teachers and CFF student respectively.

All CFF Teachers and some CFF students in the schools that had implemented the program in Year One were asked to complete a pre and post survey. This pre window was the same as the observation window (2/2/07-3/30/07). The post window was 5/7/07-6/1/07, making an overall treatment window of five weeks. 931 teachers completed the pre-survey and 631 completed the post-survey. 10,687 students took the pre-test and 5,948 students participated in the post-survey.

The surveys were taken online, and the data were sent to the research team by the Penn State Survey Research Center, after the data records had been which had been stripped of all identifying information.

The researchers familiarized themselves with the dataset and arranged the files for purposes of analysis. The researchers based the research steps upon the demands of the research questions. By relating the research questions to the initial findings based on a descriptive analysis of the available data, the researchers were able to help draft a mid-evaluation report presented to PDE in August, 2007.

After generating the initial findings, and verifying with the CFF Evaluation Team Co-Directors how the data were to be managed and presented, the researchers then ran frequencies and percentages then began making data tables for inclusion in the report. After finishing each data table, the analysts developed a spreadsheet of relevant findings.

As a second step, researchers organized the pre and posttest data in order to run Pearson Chi-squares and independent t-tests. Pearson Chi-square analyses were used to assess the significance of differences between pre and post intervention data for variables of a categorical nature, while an independent t-test analysis was conducted to look for differences between continuous numerical dependent and independent variables. An alpha level of .05 was used to indicate statistical significance for all questions.

An assumption in this research protocol was that there would not be a significant difference between the Chi Square or T-test results at that significance level for the pre and posttest. A second assumption is that the unpaired data with unequal n's can be responsibly and effectively analyzed using a chi-square. There are no assumptions of equality of sample size for a chi-square. (Stokes, M.E., Davis, C. S., and Koch, G. G. (1995). *Categorical Data Analysis Using the SAS System*. SAS Institute Inc. Cary, NC). Therefore, the unequal 'n' between pre and post assessment had no discernable outcome on the final analysis. The researchers repeated the same process used for the frequencies and percentages (creating data tables and verifying findings) with the exception that the researchers also checked the chi-square data for normality.

Further, the analyses were disaggregated per subject area. In doing so, the analysts sought to uncover how social studies teachers, for example, might respond differently to certain items than math teachers. This data was not included in the final report since the numbers of teachers from each grade level were not clearly identified in the data set. The numbers that were identified and grouped per subject area were not sufficiently high enough to include in this report.

The Teaching in Pennsylvania Record

The TPR is a “research based” observation protocol developed at the University of Virginia’s Curry School of Education, and disseminated by Casenex—an organization that UVA created to promote the development of this observation tool. The use of the TPR as a measure in the CFF Evaluation is limited to one very important research question:

- Do the instructional strategies used by CFF teachers appear to change in ways supported by the TPR's five research based domains?

District personnel in Cohort One were trained to use the TPR and the CFF Observation Tool for data collection in face-to-face training sessions in six locations across Pennsylvania. A trained data collector from each district was then charged with conducting four observations (two during the pre window, and two during the post window), of four teachers who had been randomly selected by the evaluation team. Observations occurred during two periods of time (2/2-3/30, 5/7-6/1). During the pre observation window, 341 observations were submitted. During the post, only 339 observations were submitted.

The selection of cases to analyze was performed by the CFF Evaluation Team members based on the following criteria: 1) the observation should fall within the expanded pre and post window (this window was expanded by one week on either end of the dates indicated above to allow for the maximum number of cases to be represented in the dataset), 2) the observer should have passed a certification exam developed by Casenex that measures how well the observers use the instrument, and 3) all observations should fall within the 9-12 grade range. In all, 241 cases were eliminated from the dataset based on these criteria, leaving a total of 470 cases.

Because only 46 cases were recorded in which district personnel conducted the observation on a single teacher for the required 4 observations. In light of this situation, our team decided to suspend the analysis of the 'matched pairs' and conduct the analysis based on all valid 'pre' observations and all valid 'post' observations.

The items recorded by the observers were compiled and categorized by Casenex researchers. The research domains mentioned in this research question are composite scores representing broad areas of strategic teaching. This team then compiled composite scores for each of the five attributes under analysis. These attributes of strategic teaching are listed as follows: Focus/Capacity (17 items), Syntax (17 items), Principles of Reaction (27 items), Social System (25 items), and Provisions for Evaluation items). These categories can be characterized as follows:

- **Focus/Capacity:** Teachers demonstrate this attribute when they concentrate on purpose—subject matter, goals, and objectives of the lesson. In doing so, teachers address the standards of learning including, pre-assessment of students' prior learning, interests, and abilities, including their cultural and learning needs. Teachers concentrate on facilitating the generation of 'big ideas' when guiding students in the understanding of the material.
- **Syntax:** the sequence of classroom events. The teachers attend to Syntax when they plan and implement various teaching activities. There is a special focus on transitions into clear, but smoothly implemented, beginnings, middles, and ends, of lessons.

- **Principles of Reaction:** can be thought of as the many tactics of teaching. In doing so, teachers respond to students and the classroom situation by prompting, helping, restating, eliciting, answering, probing, redirecting, connecting, rewarding, challenging, encouraging, praising and promoting desirable student performance.
- **Social System:** the attention the teacher provides to maintaining social systems conducive to student learning. This emphasis on fostering a positive social environment may include attending to classroom roles and student behavior. In creating this environment, emphasis is placed on foster positive academic and non-academic situations.
- **Provisions for Evaluation:** formative and summative purposes to student evaluation. This is used to foster both the teaching and learning process. Also, the emphasis is placed on summary judgments of student activities. The judgments are made in relation to standards of learning, goals and objective, and students' needs and abilities.

These categories served as the basis for data presented by the Casenex Team to the CFF Evaluation Team. We decided to further limit the cases for analysis by focusing on the matched pairs. A frequency analysis of the grade level revealed a relatively even distribution of cases across grade levels.

The analysts further conducted a cross-tabulation analysis upon the five variables (categories) and the pre and post cases. Next, the analysts selected cases according to subject (e.g. English) and ran the cross tabs for each of the five variables listed above. Yet, since the n's were relatively small, we did not conduct grade level analyses for these datasets. T-test statistical analysis were then conducted on the means of the five variables and the pre and post groups for all subject areas. Both the T-test value and the level of significance (p value) are indicated in the data table below. In this table, we present the statistical values (findings) of this quantitative analysis.

TPR Domain	Pre (n=234)	Post (n=236)	Mean Difference	T-Test	
	Mean	Mean		t value	p value
Focus/Capacity	11.12	13.08	1.96**	3.286	0.001
Social System	16.21	18.14	1.93	1.832	0.068
Syntax	14.04	14.25	0.21	0.277	0.782
Principles of Reaction	21.10	23.9	2.80	1.960	0.051
Provisions for Evaluation	13.94	16.18	2.24*	2.505	0.013

Interview Methodology

Interviews were conducted between 5/22/07 and 7/15/07 with all accessible CFF Coaches, Building Leaders, and CFF District Contacts in Cohort 1 who acknowledged

and consented to the interview. In this study we used a census strategy that attempted to interview each set of the primary CFF district level staff (e.g. all CFF Coaches, CFF Contacts, and CFF Principals. In the following Table we describe the number and percentages of the respondents who participated in an interview.

	Approximate Population of Informants	Interviews Conducted	Percent of Cohort 1 CFF Staff
Coaches	116	69	59.48%
Contacts	79	36	45.56%
Principals	103	57	55.33%
Total	298	162	54.36%

The findings of the interview dataset were used to verify, clarify, and bolster the more quantitative findings from the analysis of the observations and survey. Upon completion of interviews the text of the interviews were transcribed and copies were distributed to the evaluators for the appropriate sections. This was not a literal transcription of the interviews, rather the transcriber mined the audio for illustrative quotes and furthermore made comments about the responses for each research question for the whole interview. The actual management and analysis of the findings happened in two general ways. Frequencies were calculated following in the same vein as Miles and Huberman's (1994) description of analytic manipulations,

- Making a matrix of categories and placing the evidence within such categories
- Tabulating the frequency of events
- Examining the complexity of such tabulations and their relationship by calculating second-order numbers such as means and variances

Each reviewer then reviewed the text of the interviews for common themes and concepts. The second data management and analysis activity involved culling illustrative quotes. At this point the analysts culled the quotes that best represented what was reported in each interview, and kept a separate document for these findings.

An explanation of the frequency counts is warranted since at first site the frequency of the occurrences of these themes exceeds the total number of respondents in the Coaches' category. Since these frequencies measure the intensity of the use of the concepts, and not just the use itself, these frequencies often have higher numbers than the actual number of cases. For example, if a person emphasized certain categories at many points during the interview, the interviews were coded in a consistent manner for this intensity. Below, please find a data table used for authoring the report. It reports both the categories and the intensity (frequency) of use of these themes by the respondent.

	<i>Frequency</i>
a. Teachers are excited and enthusiastic about the program	34
b. Students are positive and enthusiastic about the program	23
c. Teachers began to see technology as a valuable tool in teaching	10
d. Teachers were reluctant at first	10
e. Higher level of student interest and engagement	7
f. Teachers and students are working together	5
g. Some students are negative	4
h. Teachers' attitudes about technology and students as active participants in learning are more positive	4
i. Students are more motivated and more willing to participate	3
j. Greater teacher experimentation	1
k. Seeing more teacher reflection	1
l. Some teachers are overwhelmed	1

Data triangulation was used both between reviewers that were working on a particular dataset (Coaches, Principals, or Contacts), and between these different reviewers. This process involves the use of a variety of sources in a study to generate categories. For triangulation purposes the team of researchers assigned to the analysis group (Coaches, Contacts, or Principals) met to compare findings, to pinpoint common themes (categories) and finalize concepts that were observed by all researchers.

Further cross case synthesis was used to generalize what themes the different categories of respondents touched upon. Yin (2003, pg. 133) describes the relevance of cross-case synthesis,

Cross-case synthesis can be performed whether the individual case studies have previously been conducted as independent research studies (authored by different persons) or as a redesigned part of the same study. In either situation, the technique treats each individual case as a separate study. In this way, the technique does not differ from other research syntheses—aggregating findings across a series of individual studies.

The reliability of this cross-case synthesis rests upon both the validity and strength of the previous techniques used to develop each case as well as the explanatory and argumentative interpretation of the cross case analysis. The primary strength was using highly similar research questions during the data collection phase that naturally promoted this cross case synthesis.

These final concepts, along with the frequency of their occurrence, were reported as the results of that interview segment of the study. Quotes from the interviews that particularly explained concepts or gave additional perspective on a theme were also reported as these help readers to thoroughly understand the concept explained and will let the interviewees' voices be heard in the research process.

Appendix C

The Role of the Coach in Classrooms for the Future

Interview respondents felt that much of the success of the program was based on the professional development provided, particularly the one-on-one interactions that the Coach could provide to teachers in the classroom. The importance of professional development is underscored by the numerous kinds of professional development offered by the program:

- Professional Development facilitated by the Coach.
- On-going support provided by PDE through the use of webinars.
- Professional Development provided by the technology vendors, which included strategies to use the equipment, how to use it effectively, an overview of the tools available, etc.

The just-in-time personalized assistance provided by the CFF Coach was cited as an element that heightened the success of implementation. Many comments about the most valuable aspect of CFF claim that the coach is the most valuable, as seen in a response from a district contact, “The coach, without a doubt. The reason for that answer is because that person is engaging every day, monitoring progress, encouraging teachers, it’s the kind of just in time support that is so important.” The Coach is so important that one of the principals emphatically stated, “I went to the meeting at PDE and said, “If you fund anything, the equipment is great and we love it, but please don’t get rid of our coach funds. It is just so important to us.” In performing the duties identified in their CFF job descriptions, coaches exercise numerous skills and adopt different roles. These roles include being a research provider, a learning facilitator, a school leader, a data coach, a mentor, an instructional specialist, a curriculum specialist, and most importantly—a catalyst for change.

Teacher Support

Many of the interview respondents maintained a theme -- the importance of teacher support. One principal explained, “As with all programs, it is really critical to consistently keep a high level of support there. I have seen in other programs when the level of support is tremendous in the beginning, but over time it then slacks off. I think it is really critical to continue the support throughout the next school year, and also to try to help those people who don’t seem to be utilizing the hardware and software and whole program consistently. The coach has a critical, pivotal role.” One CFF Coach describes the importance of the role as follows, “Without the coach, this program would not have seen this kind of success. You need to have someone there teaching them how to implement it. I have seen other programs where inadequate staff development caused programs to fail. You really need that teacher support. I know without the coach position, this would not work. All the teachers are operating outside their comfort zone. They need someone to be there as a ‘safety net’ for them. If you just gave them the

equipment, it wouldn't work." The presence of a coach actively involves the faculty in changing their teaching styles. Among the comments that stressed the importance of teacher training was one from a district contact who reports, "Obviously, it would be the guidance that the coach is providing."

"A major part of it is the coach providing necessary guidance, support, as well as professional development. The teacher has to have a feel and comfort level with using the technologies, but once you get past the basic nuts and bolts you have the chance to think and work creatively to develop those types of lessons." This critical support of the teachers is seen as much more than 'hand-holding,' rather it enables teachers to get to new levels of understanding of the skills necessary for the 21st Century and also the technological proficiency needed to get there.

This professional development for teachers allows one-to-one time, real support, so that the teachers can increase their skills in such a way that they are empowered and they have a positive attitude toward the change. Another by-product of the professional development is a new level of dialogue among teachers about instructional strategies and outcomes. When asked about important impacts of the program, one contact described this discourse saying that "I think the dialogue that has been created among the teachers about what kids really need to move forward. Just to get teachers to talk to each other about what is important."

Coaches' Pivotal Role

In summary, as a result of our interview process we have come to the conclusion that CFF Coaches tend to be remarkably effective in what they do. "The difference that the coach made is that everyone made progress," emphatically stated a district contact. A large portion of these respondents further maintained that the role of the Coach is crucial, if not necessary, for the implementation of the CFF program to succeed. The coach offers support on two interrelated levels: 1) supporting teacher comfort with the technology, and 2) enhancing the curriculum by using the technology. First, one principal claims, "Our Coach has been very integral in making sure the staff is comfortable with the technology." Another district contact reinforced the second role of the coach, "She is team teaching with people. She can demonstrate a new technique or technology to them and at the same time they are learning it the students can benefit from the lesson and then the teacher can go from there."

These observations are further confirmed in the academic research literature. In a rigorous study, Lowther, Ross, and Strahl (2006) claim,

The approach (in this study) was to discuss research findings from classroom observations of Program teachers who had the advantage of extensive professional development focused towards technology integration strategies and the added support of on-site technology coaches as compared to teachers in matched control settings. Not surprisingly, whole school and targeted

observations showed that technology integration in Program classes was more frequent, varied, and intensive than in Control classrooms.

This literature confirms what we are hearing on the ground from Coaches, Principals, and District Contacts. The consensus is that the CFF program would not nearly be as effective as it is without the crucial contributions that the Coaches made in the implementation of Classrooms for the Future.

Challenges Coaches Face in the implementation of CFF

After analyzing the responses to our interview questions about the most difficult aspect of the Coach's job, we conclude that the responses can be categorized into three broad themes: time pressures, promoting teacher buy-in, and supporting the shift to student centered instruction.

Time Constraints

First, the most frequently cited challenge involves the lack of time to cover all their responsibilities, for example problems scheduling professional development opportunities for teachers. One CFF Coach discussed these issues in the following manner, "The most challenging aspect of my role as a coach has been managing the time between all of the teachers. I have three teachers in one building, but I also carry three buildings so I have six teachers there and on top of that load I manage 30. It is something unique to our district. When I speak to coaches throughout the state either through listservs or conferences, there are very few coaches in our position. I am responsible for the training and facilitation of 60 teachers. Juggling time and resources is going to be a major challenge to me."

Indeed, this time factor is not only important with the coaches' schedules, but also in scheduling with teachers to provide direct support. One of the main challenges of coaches is reportedly, "melding the teachers' schedules and mine so that we can get together." When asked what their advice would be to Cohort Two CFF Coaches', one Coach mentioned that Coaches should, "work on *their* schedule (referring to teachers), make them feel important."

Achieving Teacher Buy-In

The second most frequently cited remarks focus on the issue of achieving teacher buy-in in an environment in which teachers are often reluctant. The importance of this theme is cited by one principal, "As with all programs, it is really critical to consistently keep a high level of support there. I have seen in other programs when the level of support is tremendous in the beginning, but over time it slacks off. I think it is really critical to continue the support throughout the next school year, and also to try to help those people who don't seem to be utilizing the hardware and software and whole program consistently. The coach has a critical, pivotal role." A central challenge of the coach is

summed up as follows, “listen to the teachers and find out what they already know about technology and find out what they hope to achieve through the use of technology.”

By doing so, Coaches face the challenge of building a rapport with the teachers that calms anxieties, tensions, and social conflicts. One coach reminds others that everyone needs patience, “from the delivery of equipment to the technicians setting it up to the teachers that are working with it. They will have better results if they have patience and a less antagonistic approach. With time, good things will happen.”

Another challenge is achieving teacher buy in within environments where there are various levels of expertise and conflicting pressures on teacher time (including efforts to achieve NCLB requirements). In such environments, coaches further face the lack of teacher enthusiasm and frustration. Coaches generally respond to the need to promote teacher buy-in by letting teachers know that they are available and further eager to help in any way possible. One CFF Coach suggests that all coaches should, “work with the teachers so that you can establish a relationship that gives them the understanding that you are there to support them and help them in any way possible. Much of the lack of enthusiasm about the program is perhaps attributed to the sheer number of different federal, state, and local programs that compete for their attention. One coach describes this lack of teacher’s buy-in as follows, “over the years there have been so many state initiatives year after year that come and go, so they are a little tired of that, so it is a little bit challenging to get them interested.” Yet on the other hand this exhaustion may turn to excitement as witnessed by one CFF Coach who reported, “This program has rejuvenated veteran teachers.”

Shifting to Student Centered Instruction

Finally, some Coaches report that it is a challenge to help teachers shift from teacher-based to student-based instruction with competency in both the content and the technology. According to one Coach, “The Coaches should be the type of people who are not just technology people but people who are very interested in education. The Coach needs to be an academic motivator in the subject area that the teachers are working with. I think they have to make an effort because the teacher is motivated about their own area of expertise. The Coach should try to know something about it as well as help with integration.” Further, Coaches report that they encourage teachers to juggle the various new roles and skills that CFF is asking teachers to fulfill. According to one CFF Coach, “Keeping the content and the 21st Century skills all together is a challenge. The teacher's level of competency is not with the technology—it is with the content. I must find and remind the teacher of that teachable moment when the technology should take the moment for leading instruction. Just like the students, each teacher is finding a teachable moment when that light comes on. This is the right moment to make the shift from a teacher-based lesson to a student-based lesson.”

Solid Basis in Supporting Teachers

In sum, by and large our respondents believe that despite these challenges, CFF has a solid basis for supporting teachers through its coaching initiative. Coaches, Principals, and CFF District Contacts consistently report many positive aspects about the management of the program, as witnessed by one CFF Coach, “There has been time I wondered why I signed up for this. One of the big things about the initiative is the backing and the teamwork. They are giving you the professional development, they are giving you the training, they are giving you the support with the grant as well.”

Strategies Reported as Beneficial by CFF Coaches

Supporting Teachers

“Hand-holding” and emotional support of teachers as they confront the challenges related to the integration of technology in their classroom were reported by coaches as being important aspects of their work. Among the most often expressed description of successful strategies, the majority of the responses revolve around the support of the affective domain. “Being emotionally supportive,” “helping teachers become comfortable with the technology,” “building trust and credibility,” “being available for teachers,” “don’t impose on teachers” and “being enthusiastic and having a positive attitude,” are all frequently expressed comments that center on this affective domain. An illustrative example of this sentiment is expressed by one CFF Coach, “the way I did the professional development made the teachers feel comfortable. Teachers told me, ‘I was scared to come in here to do this stuff, but you made it easy and not intimidating.’”

District Contacts and Principals also view attention to the affective domain as important. CFF Coaches often aid their colleagues through scaffolding and helping teachers feel competent with the new instructional strategies and the technology. One principal reported the belief that the primary Coach responsibility is to “be as supportive and enthusiastic about the program as possible.”

One district contact specifically claims that “handholding” is an important CFF Coach responsibility as seen in the following, “We have had two coaches who are splitting the time between them and what they developed to work with teachers was a three step process. For the first time, they would show how it was done, the 2nd time they would provide assistance if the teacher needed it, and the 3rd time they would stand in the back of the room and were silent unless something disastrous happened. We had previously talked about teachers taking risks and having the Coach there mitigated a lot of that risk.”

Having patience with the process of helping teachers incorporate technology into their classrooms is seen as central to the coaching process. Providing advice to other CFF Coaches, one respondent noted, “Don’t push teachers too hard. Take one step at a time with teachers.” In doing so, many CFF Coaches call for patience by all parties involved in the implementation—coaches, teachers, administrator, technicians, etc. One principal

noted, “Being available to 22 people is very hard. It is the human quality that makes the Coaches’ role important. It is his patience and his knowledge. Instead of making someone feel like a idiot for not knowing how to integrate the technology, rather it is let me show you and then you try.”

Professional Development

Another important aspect of the Coaches’ role involves direct one-to-one mentoring in their professional development work. Many CFF Coaches cite as important to their work the following activities: co-teaching, peer tutoring, providing direct support to help teachers differentiate instruction, modeling technology, and fostering communication. While providing these services, teachers are in turn advocates for the teachers in the implementation process. Modeling is mentioned by most principals as the crucial role of the Coach. In doing so, CFF Coaches provide a support system that allows this mentoring to occur.

One District Contact claims that “the most important responsibility is the modeling and the integration of technology” that the Coaches provide. A coach summarizes the positive attributes of the program in the following manner, “There have been times that I wondered why I signed up for this. One of the big things about this initiative is the support and the teamwork. We are giving teachers the professional development, the training, and the resource support that the grant offers.” Finally, principals involved in the CFF program frequently cite as important responsibilities of the Coach the ability to be approachable, available, and able to foster communication between all parties involved. What is perceived as needed from the Coach is the just-in-time one-on-one assistance that teachers need.

What is the role of the coach mentor?

The Coach Mentors are also perceived to have a positive impact on the implementation of the CFF program. Many Coaches reported that they have a good rapport with their Mentors. Further, the Mentors are seen to occupy a leadership position in the implementation of the CFF initiative, mainly by being the main point of contact for coaches with the overall program. According to one Coach, “CFF Mentors are a huge part of the program. We have a CFF team and the mentors are a big part of the program.” Indeed, the coach mentors are seen as the glue that keeps the overall CFF initiative together, as one coach describes, “They have been outstanding. I can’t believe all the work that they have been doing on a part-time basis here. They’ve kept the coaches together. When the program first started to roll out and things seemed to be fraying along the edges, the coach mentors did such a good job in allaying any fears that people had.”

Further positive descriptions of the Coach Mentors’ value focus on how they are helpful, supportive, available, and flexible and trustworthy. Some integral activities of the Coach Mentors include the scheduling of meetings for Coaches, participation in the online community, providing resources and professional development, and in general fostering

communication within the program. This communication is witnessed in the online coach community that Coaches' perceive (and Mentors claim) has been very effective during the first year of implementation.

Nonetheless, a minority of individuals described ambivalent perspectives on the role of the Coach Mentors. Typical of these comments include the following from a CFF Coach, "I went to boot camp with the coach mentor. The coach mentor is part of our web-based community. There is some involvement in small group sessions, but the coach mentor hasn't had a large impact." Other individuals desired that they had more support from the Coach Mentors as seen in the following, "I would like to see more site visits from the coach mentor so that they can see the global picture." One the whole, these perspectives do not diminish the positive impressions about the role of the Coach Mentor, rather they indicate some positive feedback as to how the Coach Mentors can direct their activities in the future.

Appendix D

Teacher and Student Survey Tables

Teacher Survey Tables

As discussed in Appendix B, the CFF Surveys were conducted by the Penn State Survey Research Center and analyzed by the CFF Evaluation. Below, please find tables displaying the analyses produced by the CFF Evaluation Team. Teacher and Student surveys were administered two times during the school year. All participating teachers and students are asked to respond to the surveys that are online and hosted at Pennsylvania State University.

A total of 931 teachers participated in the pre survey, with 631 participating in the post. The discrepancy between the two sample sizes may be due to a number of factors, including the relatively short time period between pre and post surveys, school level end of the academic years stresses, and further district level confusion about the requirements of the evaluation process.

Which of the following best describes the way your class is arranged?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Desks in rows	62%	62%	0%	15.993	0.915
Small clusters of students desks	13%	17%	4%		
Students desks in circles or semi circles	7%	5%	-2%		
Classrooms along classrooms walls	3%	3%	0%		
Other	12%	7%	-5%		

Percentage of Time: Whole group lecture/instruction	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	25%	20%	-5%	0.809	11.000
16%-30%	32%	34%	2%		
31%-50%	28%	26%	-1%		
More than 50%	14%	15%	1%		
Percentage of Time: Leading a whole class discussion	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	29%	23%	-6%	0.387	16.981
16%-30%	34%	37%	4%		
31%-50%	24%	24%	0%		
More than 50%	8%	9%	1%		
Percentage of Time: Working with small groups of students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	30%	25%	-4%	0.309	18.258
16%-30%	44%	44%	0%		
31%-50%	17%	19%	2%		
More than 50%	5%	7%	2%		
Percentage of Time: Working with individual students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	50%	44%	-5%	0.422	16.455
16%-30%	33%	34%	1%		
31%-50%	12%	11%	-1%		
More than 50%	3%	5%	2%		
Percentage of Time: Working, observing, and interacting with students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	18%	15%	-3%	0.766	11.682
16%-30%	35%	35%	0%		
31%-50%	23%	23%	0%		
More than 50%	23%	22%	-1%		
Percentage of Time: Working at your desk or working on other work not involving students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1%-15%	84%	81%	-3%	0.611	13.839
16%-30%	5%	7%	2%		
31%-50%	2%	3%	1%		
More than 50%	1%	3%	2%		

How would you describe the content your class is designed to convey?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Almost all content knowledge	6%	7%	1%	0.001	54.534
More content knowledge that higher order skills	24%	22%	-2%		
Half content knowledge and half higher order skills	55%	51%	-4%		
More higher order skills than content knowledge	13%	14%	1%		
Almost all higher order skills	3%	3%	0%		

How would you describe your teaching style	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Didactic; providing instruction and direction	8%	7%	-1%	0.000	110.725
More didactic than constructivist	23%	21%	-2%		
An even balance of didactic and constructivist	47%	44%	-2%		
More constructivist than didactic	16%	18%	1%		
Constructivist; guiding students as they build understanding	6%	7%	1%		

How would you describe the work that students do?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Exercises and assignments submitted to teacher only	25%	19%	-6%	0.636	21.992
A blend of the first option (i.e. option "a") and the last option (i.e. option "e"), but more "a" than "e"	38%	35%	-3%		
A balance between the first (i.e. option "a") and last option (i.e. option "e")	27%	28%	2%		
A blend of the first option (i.e. option "a") and the last option (i.e. option "e"), but more "e" than "a"	9%	11%	2%		
Projects and products that resemble what people do outside of school	2%	4%	2%		

What percentage of your time would you say is directed to the development of "21st century skills," such as creativity, problem solving, teamwork, critical thinking, and multimedia communication skills?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	1%	1%	1%	0.289	23.001
1% to 25%	33%	27%	-6%		
25% to 50%	36%	37%	1%		
25% to 75%	22%	22%	0%		
More than 75%	9%	10%	1%		

During a typical class, what percentage of your students would you say are "actively engaged" in the class (paying close attention and doing what the teacher has asked)?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0 to 20%	2%	1%	0%	0.316	22.461
21% to 40%	8%	6%	-2%		
41% to 60%	23%	21%	-2%		
60% to 80%	38%	40%	3%		
More than 80%	29%	29%	-1%		

Computer application: Educational Management software (attendance, grades, lesson plans, etc.)	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Don't use	3%	3%	-1%	0.966	13.719
	Not valuable	0%	1%	1%		
	Little value	3%	3%	1%		
	Valuable	26%	28%	2%		
	Very valuable	67%	61%	-6%		
Computer application: Drill & practice software, integrated learning systems and/or educational games	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Don't use	41%	32%	-10%	0.757	19.805
	Not valuable	3%	5%	2%		
	Little value	16%	21%	5%		
	Valuable	31%	32%	1%		
	Very valuable	8%	6%	-2%		

Computer application: Word processing	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	8%	5%	-2%	0.737	20.189
Not valuable	1%	1%	0%		
Little value	9%	9%	0%		
Valuable	34%	34%	0%		
Very valuable	47%	45%	-1%		
Computer application: Data management (spreadsheets), graphing, or analysis software (EXCEL, SPSS, STATEVIEW, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	33%	30%	-3%	0.421	25.756
Not valuable	5%	4%	-1%		
Little value	18%	17%	-1%		
Valuable	32%	34%	3%		
Very valuable	13%	11%	-1%		
Computer application: Database software (FileMaker Pro, Microsoft Access)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	62%	52%	-10%	0.018	42.083
Not valuable	5%	8%	2%		
Little value	15%	19%	4%		
Valuable	14%	15%	1%		
Very valuable	4%	3%	0%		
Computer application: Presentation software (Keynote, PowerPoint, Profcast)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	18%	14%	-4%	0.228	29.914
Not valuable	3%	2%	-1%		
Little value	13%	10%	-3%		
Valuable	36%	35%	-1%		
Very valuable	30%	35%	5%		
Computer application: Email	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	6%	7%	1%	0.655	21.667
Not valuable	2%	3%	0%		
Little value	8%	9%	1%		
Valuable	29%	27%	-2%		
Very valuable	54%	50%	-4%		

Computer application: Other communication tools (Instant Messaging, iChat, discussion boards, video conferencing, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	59%	48%	-11%	0.274	28.754
Not valuable	5%	8%	3%		
Little value	14%	14%	0%		
Valuable	15%	19%	4%		
Very valuable	7%	7%	1%		
Computer application: Desktop publishing software (PageMaker, Pages, Microsoft Publisher, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	50%	43%	-7%	0.435	25.496
Not valuable	6%	7%	1%		
Little value	15%	15%	0%		
Valuable	19%	23%	4%		
Very valuable	10%	7%	-3%		
Computer application: Web publishing software (Dreamweaver, iWeb, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	67%	56%	-11%	0.554	23.404
Not valuable	5%	9%	4%		
Little value	10%	13%	2%		
Valuable	12%	15%	3%		
Very valuable	6%	4%	-2%		
Computer application: Internet for research	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	8%	5%	-3%	0.733	20.270
Not valuable	2%	3%	1%		
Little value	10%	9%	-1%		
Valuable	29%	30%	1%		
Very valuable	50%	50%	0%		
Computer application: Multimedia reference tools (CD-ROMS, online encyclopedia)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	27%	21%	-6%	0.683	21.172
Not valuable	4%	4%	0%		
Little value	16%	14%	-2%		
Valuable	35%	38%	4%		
Very valuable	18%	18%	0%		

Computer application: Simulations/modeling software	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	55%	47%	-8%	0.124	33.292
Not valuable	4%	6%	2%		
Little value	12%	14%	1%		
Valuable	19%	23%	4%		
Very valuable	8%	7%	-2%		
Computer application: Video, graphics, or sound editing/production software (iTunes, Movie Maker, iMovie, iDVD, Garage Band, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	57%	45%	-12%	0.474	24.802
Not valuable	5%	5%	1%		
Little value	11%	13%	2%		
Valuable	17%	22%	5%		
Very valuable	10%	11%	1%		
Computer application: Probeware (input devices for gathering data)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	70%	59%	-11%	0.535	23.736
Not valuable	4%	7%	3%		
Little value	9%	10%	1%		
Valuable	10%	15%	5%		
Very valuable	6%	4%	-2%		
Computer application: Web based digital curriculum or curriculum resources	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	43%	34%	-9%	0.135	32.826
Not valuable	5%	6%	1%		
Little value	14%	16%	2%		
Valuable	28%	29%	2%		
Very valuable	10%	10%	0%		
Computer application: Other web based learning activities	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	33%	25%	-8%	0.762	19.706
Not valuable	4%	5%	1%		
Little value	18%	17%	-1%		
Valuable	33%	36%	3%		
Very valuable	12%	12%	0%		

Overall, how valuable are the technologies current in your class	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	4%	3%	-1%	0.078	35.587
Not valuable	5%	4%	-1%		
Little value	16%	13%	-4%		
Valuable	46%	45%	-1%		
Very valuable	28%	31%	3%		

Instructional strategy: Teacher lecture or demonstration	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	1%	0%	0%	0.099	34.433
Not valuable	1%	1%	0%		
Little value	6%	7%	1%		
Valuable	56%	61%	5%		
Very valuable	36%	28%	-8%		
Instructional strategy: Teacher-led discussion aimed at factual, knowledge-level content	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	1%	1%	0%	0.467	24.915
Not valuable	2%	1%	0%		
Little value	8%	10%	2%		
Valuable	56%	58%	2%		
Very valuable	31%	25%	-6%		
Instructional strategy: Teacher-led discussion aimed at high-level outcomes (synthesis, evaluation, integration, application, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	2%	1%	-1%	0.897	16.568
Not valuable	1%	1%	0%		
Little value	5%	6%	1%		
Valuable	43%	47%	5%		
Very valuable	48%	41%	-8%		
Instructional strategy: Project based learning	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	7%	6%	-1%	0.199	30.714
Not valuable	2%	3%	1%		
Little value	16%	13%	-4%		
Valuable	47%	44%	-3%		
Very valuable	26%	31%	4%		

Instructional strategy: Problem based learning	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	4%	3%	-1%	0.993	10.971
Not valuable	1%	1%	1%		
Little value	8%	9%	2%		
Valuable	53%	52%	-1%		
Very valuable	33%	30%	-3%		
Instructional strategy: Authentic learning (learning tied to the world outside the classroom)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	5%	3%	-2%	0.691	21.027
Not valuable	2%	2%	0%		
Little value	8%	6%	-2%		
Valuable	45%	47%	2%		
Very valuable	39%	37%	-1%		
Instructional strategy: Multi-modal teaching (i.e., visual, auditory, kinesthetic)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	4%	4%	0%	0.063	36.602
Not valuable	2%	1%	-1%		
Little value	8%	8%	0%		
Valuable	43%	45%	2%		
Very valuable	41%	37%	-4%		
Instructional strategy: Peer teaching or peer tutoring	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	8%	7%	-2%	0.491	24.502
Not valuable	4%	3%	0%		
Little value	16%	15%	-2%		
Valuable	48%	48%	1%		
Very valuable	22%	23%	1%		
Instructional strategy: Collaborative learning- informal (no formal roles assigned)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Don't use	10%	8%	-3%	0.003	49.150
Not valuable	4%	3%	-1%		
Little value	18%	19%	2%		
Valuable	46%	45%	-1%		
Very valuable	20%	20%	0%		

Instructional strategy: Collaborative learning with formal roles	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Don't use	18%	13%	-4%	0.360	26.911
	Not valuable	4%	3%	-1%		
	Little value	18%	18%	1%		
	Valuable	43%	43%	0%		
Very valuable	16%	19%	3%			
Instructional strategy: WebQuests	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Don't use	50%	40%	-10%	0.870	17.305
	Not valuable	4%	5%	1%		
	Little value	13%	17%	4%		
	Valuable	24%	26%	2%		
Very valuable	8%	8%	0%			
Instructional strategy: Learning centers	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Don't use	53%	43%	-10%	0.359	26.947
	Not valuable	4%	5%	1%		
	Little value	15%	15%	0%		
	Valuable	21%	26%	5%		
Very valuable	5%	6%	1%			

Time spend by a student: Listening to the teacher (in a large group setting)	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	0%-20%	14%	14%	0%	0.032	39.556
	21%-40%	28%	26%	-2%		
	41%-60%	31%	29%	-2%		
	61%-80%	20%	19%	-1%		
More than 80%	7%	8%	1%			
Time spend by a student: Listening to other students (in a large group setting)	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	0%-20%	38%	30%	-8%	0.382	26.494
	21%-40%	38%	37%	-1%		
	41%-60%	15%	18%	3%		
	61%-80%	6%	8%	2%		
More than 80%	2%	3%	1%			

Time spend by a student: Working independently	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0%-20%	30%	28%	-2%	0.971	13.408
21%-40%	46%	42%	-4%		
41%-60%	17%	16%	-1%		
61%-80%	4%	7%	3%		
More than 80%	2%	3%	1%		
Time spend by a student: Working in groups	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0%-20%	27%	23%	-4%	0.016	42.415
21%-40%	42%	40%	-2%		
41%-60%	20%	17%	-3%		
61%-80%	7%	12%	5%		
More than 80%	2%	4%	2%		
Time spend by a student: Talking with the teacher in 1-to-1 or small group conversations	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0%-20%	52%	46%	-6%	0.728	20.361
21%-40%	33%	33%	0%		
41%-60%	9%	10%	1%		
61%-80%	3%	5%	2%		
More than 80%	2%	2%	0%		
Time spend by a student: Off task (not doing what the teacher intended)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0%-20%	78%	80%	2%	0.633	20.056
21%-40%	15%	12%	-3%		
41%-60%	3%	3%	0%		
61%-80%	2%	2%	0%		
More than 80%	1%	0%	-1%		
Time spend by a student: Using computers	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
0%-20%	62%	46%	-16%	0.060	36.828
21%-40%	22%	26%	4%		
41%-60%	8%	14%	6%		
61%-80%	4%	6%	2%		
More than 80%	3%	4%	1%		

Student's grade is based on: Tests and quizzes	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	1%	1%	0%	0.263	23.534
1%-25%	22%	23%	1%		
25%-50%	37%	36%	-1%		
51%-75%	29%	25%	-4%		
More than 75%	11%	10%	-1%		
Student's grade is based on: Papers and written reports	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	21%	18%	-3%	0.655	21.672
1%-25%	39%	35%	-4%		
25%-50%	28%	32%	4%		
51%-75%	9%	9%	0%		
More than 75%	2%	2%	0%		
Student's grade is based on: Working independently	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	11%	10%	-1%	0.997	9.672
1%-25%	55%	53%	-2%		
25%-50%	21%	20%	-1%		
51%-75%	8%	9%	1%		
More than 75%	3%	4%	1%		
Student's grade is based on: Oral reports and presentations	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	32%	27%	-5%	0.008	45.362
1%-25%	48%	42%	-6%		
25%-50%	15%	17%	2%		
51%-75%	3%	7%	4%		
More than 75%	1%	2%	1%		
Student's grade is based on: Projects	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	17%	13%	-4%	0.300	28.168
1%-25%	50%	45%	-5%		
25%-50%	22%	26%	4%		
51%-75%	8%	8%	0%		
More than 75%	2%	5%	3%		

Student's grade is based on: Class participation	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	19%	14%	-5%	0.475	24.779
1%-25%	58%	53%	-5%		
25%-50%	14%	15%	1%		
51%-75%	5%	7%	2%		
More than 75%	3%	7%	4%		
Student's grade is based on: Work produced by a group or team, rather than individually	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
None (0%)	21%	17%	-4%	0.366	26.792
1%-25%	56%	52%	-4%		
25%-50%	17%	16%	-1%		
51%-75%	4%	6%	2%		
More than 75%	1%	6%	5%		

The contribution of technology in teaching my subject ten years from now	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Minimal	1%	1%	0%	0.003	48.74
Marginal	3%	3%	0%		
Moderate	15%	15%	0%		
Significant	40%	41%	1%		
Very significant	40%	36%	-4%		

Given the tools and resources available to me, the learning experience I can offer to my students is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Poor	3%	1%	-2%	0.673	21.354
OK	9%	8%	-1%		
Good	22%	18%	-4%		
Very good	41%	40%	-1%		
Excellent	23%	27%	4%		

Students learn a lot in my classroom	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	0%	1%	1%	0.955	18.190
Disagree	0%	0%	0%		
Somewhat Disagree	1%	1%	0%		
Somewhat Agree	12%	8%	-4%		
Agree	48%	48%	0%		
Strongly Agree	38%	39%	1%		
I can expect work of the highest quality from our students.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	0%	1%	1%	0.997	17.005
Disagree	3%	2%	-1%		
Somewhat Disagree	9%	5%	-4%		
Somewhat Agree	29%	25%	-4%		
Agree	38%	38%	0%		
Strongly Agree	20%	24%	4%		
I feel better prepared to teach than I did last year.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	1%	1%	0%	0.754	29.870
Disagree	3%	3%	0%		
Somewhat Disagree	7%	4%	-3%		
Somewhat Agree	19%	18%	-1%		
Agree	38%	40%	2%		
Strongly Agree	31%	30%	-1%		
I am working HARDER than I have in past years.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	1%	1%	0%	0.924	24.643
Disagree	3%	2%	-1%		
Somewhat Disagree	6%	6%	0%		
Somewhat Agree	20%	16%	-4%		
Agree	34%	33%	-1%		
Strongly Agree	35%	37%	2%		
I am working LONGER than I have in past years.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	1%	1%	0%	0.051	50.938
Disagree	5%	3%	-2%		
Somewhat Disagree	10%	8%	-2%		
Somewhat Agree	22%	20%	-2%		
Agree	31%	29%	-2%		
Strongly Agree	30%	34%	4%		

I would recommend teaching to a friend considering entering the profession.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	5%	6%	1%	0.756	29.838
Disagree	7%	5%	-2%		
Somewhat Disagree	11%	9%	-2%		
Somewhat Agree	25%	24%	-1%		
Agree	34%	33%	-1%		
Strongly Agree	18%	18%	0%		
I have the technology skills I need to teach my subject using the best methods available.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	5%	3%	-2%	0.565	33.971
Disagree	7%	6%	-1%		
Somewhat Disagree	13%	10%	-3%		
Somewhat Agree	30%	26%	-4%		
Agree	29%	34%	5%		
Strongly Agree	16%	15%	-1%		
Students in my classroom are generally well behaved and do what they are asked to do.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	1%	2%	1%	0.093	40.634
Disagree	3%	3%	0%		
Somewhat Disagree	7%	5%	-2%		
Somewhat Agree	17%	16%	-1%		
Agree	41%	40%	-1%		
Strongly Agree	31%	31%	0%		
I feel comfortable and confident while teaching.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Disagree	1%	0%	-1%	0.980	11.980
Disagree	0%	0%	0%		
Somewhat Disagree	1%	1%	0%		
Somewhat Agree	7%	6%	-1%		
Agree	35%	35%	0%		
Strongly Agree	56%	53%	-3%		

My Classroom for the Future coach was valuable in teaching me to operate computers, networks, or software programs	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	29%	15%	-14%	0.281	28.605
Not Valuable	3%	4%	1%		
Little Value	10%	12%	2%		
Valuable	36%	39%	3%		
Very Valuable	21%	24%	3%		

My Classroom for the Future coach was valuable in suggesting ways to incorporate technology to teach the content in my classes.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	28%	13%	-15%	0.288	28.429
Not Valuable	3%	3%	0%		
Little Value	12%	16%	4%		
Valuable	34%	40%	6%		
Very Valuable	22%	23%	1%		
My Classroom for the Future coach was valuable in teaching demonstration lessons in my classroom	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	56%	45%	-11%	0.927	15.580
Not Valuable	5%	5%	0%		
Little Value	9%	11%	2%		
Valuable	17%	20%	3%		
Very Valuable	11%	12%	1%		
My Classroom for the Future coach was valuable in solving technical problems (Printer won't print, network is down, etc.)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	33%	24%	-9%	0.878	17.101
Not Valuable	4%	5%	1%		
Little Value	7%	10%	3%		
Valuable	30%	30%	0%		
Very Valuable	24%	25%	1%		
My Classroom for the Future coach was valuable in helping me think about how to assess technology-rich lessons	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	42%	28%	-14%	0.311	27.936
Not Valuable	6%	6%	0%		
Little Value	12%	15%	3%		
Valuable	25%	30%	5%		
Very Valuable	13%	16%	3%		
My Classroom for the Future coach was valuable in observing my instruction and providing feedback	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	50%	41%	-9%	0.245	29.469
Not Valuable	5%	5%	0%		
Little Value	10%	12%	2%		
Valuable	23%	22%	-1%		
Very Valuable	10%	13%	3%		

My Classroom for the Future coach was valuable in advising me on how to use technology through a differentiated instruction approach to meet individual student needs.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	N/A	45%	31%	-14%	0.366	26.804
	Not Valuable	5%	6%	1%		
	Little Value	11%	15%	4%		
	Valuable	24%	28%	4%		
	Very Valuable	13%	14%	1%		
My Classroom for the Future coach was valuable in leading CFF-related professional development workshops	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	N/A	31%	18%	-13%	0.711	20.672
	Not Valuable	5%	6%	1%		
	Little Value	12%	13%	1%		
	Valuable	31%	35%	4%		
	Very Valuable	20%	21%	1%		
Overall, how important is the CFF Coach to the success of your school's CFF effort?	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	N/A	20%	8%	-12%	0.296	28.268
	Not Valuable	4%	6%	2%		
	Little Value	10%	11%	1%		
	Valuable	32%	37%	5%		
	Very Valuable	32%	32%	0%		

My building principal was valuable in suggesting ways to incorporate technology to teach the content in my classes.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	N/A	59%	49%	-10%	0.959	14.160
	Not Valuable	7%	8%	1%		
	Little Value	10%	11%	1%		
	Valuable	19%	20%	1%		
Very Valuable	4%	6%	2%			
My building principal was valuable in teaching demonstration lessons in my classroom	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	N/A	78%	67%	-11%	0.572	23.099
	Not Valuable	7%	6%	-1%		
	Little Value	5%	6%	1%		
	Valuable	7%	10%	3%		
Very Valuable	2%	4%	2%			

My building principal was valuable in helping me think about how to assess technology-rich lessons	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	66%	55%	-11%	0.393	26.269
Not Valuable	7%	7%	0%		
Little Value	8%	9%	1%		
Valuable	15%	18%	3%		
Very Valuable	3%	5%	2%		
My building principal was valuable in observing my instruction and providing feedback	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	33%	32%	-1%	0.834	18.201
Not Valuable	6%	5%	-1%		
Little Value	12%	11%	-1%		
Valuable	34%	33%	-1%		
Very Valuable	13%	13%	0%		
My building principal was valuable in advising me on how to use technology through a differentiated instruction approach to meet individual student needs	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	64%	54%	-10%	0.450	25.219
Not Valuable	7%	8%	1%		
Little Value	9%	8%	-1%		
Valuable	15%	18%	3%		
Very Valuable	3%	6%	3%		
Overall, how important has your building principal been to the success of your school's CFF effort?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
N/A	35%	25%	-10%	0.742	20.094
Not Valuable	11%	12%	1%		
Little Value	15%	17%	2%		
Valuable	28%	29%	1%		
Very Valuable	10%	10%	0%		

In my classroom computer failure is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	24%	20%	-4%	0.589	22.812
Small Problem	36%	39%	3%		
Problem	22%	17%	-5%		
Significant Problem	10%	13%	3%		
Huge Problem	6%	5%	-1%		

In my classroom network downtime is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	25%	27%	2%	0.338	27.356
Small Problem	38%	35%	-3%		
Problem	20%	17%	-3%		
Significant Problem	10%	11%	1%		
Huge Problem	5%	5%	0%		
In my classroom battery issues is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	55%	54%	-1%	0.603	22.572
Small Problem	22%	25%	3%		
Problem	11%	8%	-3%		
Significant Problem	5%	4%	-1%		
Huge Problem	3%	3%	0%		
In my classroom smart board problems is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	50%	44%	-6%	0.928	15.547
Small Problem	19%	29%	10%		
Problem	11%	11%	0%		
Significant Problem	6%	5%	-1%		
Huge Problem	4%	3%	-1%		
In my classroom projector problems is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	57%	57%	0%	0.583	22.899
Small Problem	20%	22%	2%		
Problem	10%	7%	-3%		
Significant Problem	4%	4%	0%		
Huge Problem	3%	2%	-1%		
In my classroom sound problems is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	60%	60%	0%	0.477	24.733
Small Problem	18%	20%	2%		
Problem	8%	7%	-1%		
Significant Problem	4%	3%	-1%		
Huge Problem	2%	2%	0%		

In my classroom printing problems is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	40%	36%	-4%	0.931	15.413
Small Problem	28%	30%	2%		
Problem	14%	13%	-1%		
Significant Problem	8%	8%	0%		
Huge Problem	6%	6%	0%		
In my classroom theft is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	77%	77%	0%	0.481	24.671
Small Problem	9%	7%	-2%		
Problem	4%	4%	0%		
Significant Problem	3%	2%	-1%		
Huge Problem	2%	2%	0%		
In my classroom vandalism is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	75%	75%	0%	0.550	23.465
Small Problem	9%	9%	0%		
Problem	5%	4%	-1%		
Significant Problem	3%	2%	-1%		
Huge Problem	3%	2%	-1%		
In my classroom plagiarism is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	54%	53%	-1%	0.781	19.336
Small Problem	17%	18%	1%		
Problem	13%	12%	-1%		
Significant Problem	7%	5%	-2%		
Huge Problem	4%	5%	1%		
In my classroom lack of technical support is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	49%	51%	2%	0.534	23.745
Small Problem	24%	22%	-2%		
Problem	13%	10%	-3%		
Significant Problem	6%	6%	0%		
Huge Problem	4%	4%	0%		

In my classroom inadequate professional development is:	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
No Problem	36%	36%	0%	0.688	21.075
Small Problem	22%	22%	0%		
Problem	17%	18%	1%		
Significant Problem	12%	9%	-3%		
Huge Problem	9%	9%	0%		

Student Survey Tables

The student surveys were conducted during the same time period (windows) as the teacher survey. A total of 10,687 students participated in the pre survey, with many of those (631) participated in the post. Questions asked of students are similar to those asked of teachers. The encouragement of both the surveys is to focus on classroom level issues. Presented below are the data tables for the student survey, showing where appropriate the frequencies, changes in percentages, the Chi Square or T-test values, and the appropriate level of significance found during the analysis.

My classes help me to build 21st century skills	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	21%	25%	4%	0.110	27.956
Agree	52%	48%	-4%		
Neutral	20%	19%	-1%		
Disagree	4%	4%	0%		
Strongly Disagree	2%	2%	0%		

How much of the time does the teacher spend leading whole class discussions	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	23%	22%	-1%	0.016	35.906
More than half	30%	30%	0%		
About half	26%	28%	2%		
Some, but less than half	14%	13%	-1%		
Rarely or none of the time	5%	5%	0%		

How much of the time does the teacher spend lecturing or telling us about the subject	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	24%	24%	0%	0.772	15.083
More than half	30%	30%	0%		
About half	26%	27%	1%		
Some, but less than half	15%	13%	-2%		
Rarely or none of the time	3%	3%	0%		
How much of the time does the teacher spend working with small groups of students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	10%	10%	0%	0.060	30.638
More than half	16%	17%	1%		
About half	24%	27%	3%		
Some, but less than half	31%	28%	-3%		
Rarely or none of the time	16%	15%	-1%		
How much of the time does the teacher spend working with individual students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	12%	12%	0%	0.027	33.836
More than half	18%	19%	1%		
About half	24%	25%	1%		
Some, but less than half	30%	28%	-2%		
Rarely or none of the time	14%	13%	-1%		
How much of the time does the teacher spend walking around the classroom observing and helping students	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	31%	28%	-3%	0.632	17.327
More than half	23%	24%	1%		
About half	19%	22%	3%		
Some, but less than half	16%	14%	-2%		
Rarely or none of the time	9%	8%	-1%		

How much time I spend in my classes doing really complex thinking and problem-solving	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all	11%	13%	2%	0.407	20.838
More than half	27%	25%	-2%		
About half	37%	37%	0%		
Some, but less than half	17%	15%	-2%		
Rarely or none of the time	7%	7%	0%		

How much time I spend in my classes learning processes and “steps” in processes and then following those steps on assignments or tests	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	All or almost all	20%	18%	-2%	0.384	21.228
	More than half	35%	34%	-1%		
	About half	28%	31%	3%		
	Some, but less than half	11%	10%	-1%		
Rarely or none of the time	4%	4%	0%			
How much time I spend in my classes learning information by listening or reading and then remembering that information on assignments or tests.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	All or almost all	25%	22%	-3%	0.553	18.518
	More than half	35%	35%	0%	0.553	18.518
	About half	25%	27%	2%	0.553	18.518
	Some, but less than half	10%	9%	-1%	0.553	18.518
Rarely or none of the time	3%	4%	1%	0.553	18.518	
How much time I spend in my classes just kind of sitting back and not really concentrating on anything	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	All or almost all	6%	8%	2%	0.939	11.268
	More than half	9%	10%	1%		
	About half	15%	18%	3%		
	Some, but less than half	27%	23%	-4%		
Rarely or none of the time	40%	36%	-4%			

Who controls or makes decisions about the topics studied in this class?	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	The teacher, completely	60%	54%	-6%	0.507	19.225
	The teacher, mostly	28%	28%	0%		
	It's about half and half	9%	13%	4%		
	Students, mostly	1%	2%	1%		
Students, completely	1%	1%	0%			
Who controls or makes decisions about the way in which we study the topics in this class?	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	The teacher, completely	31%	27%	-4%	0.748	15.483
	The teacher, mostly	36%	35%	-1%		
	It's about half and half	22%	25%	3%		
	Students, mostly	7%	6%	-1%		
Students, completely	2%	2%	0%			

Who controls or makes decisions about whether we work together or alone in this class?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The teacher, completely	33%	29%	-4%	0.427	20.504
The teacher, mostly	32%	31%	-1%		
It's about half and half	24%	28%	4%		
Students, mostly	7%	6%	-1%		
Students, completely	2%	2%	0%		
Who controls or makes decisions about the specific topics of papers or assignments in this class?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The teacher, completely	52%	45%	-7%	0.653	17.005
The teacher, mostly	28%	29%	1%		
It's about half and half	13%	17%	4%		
Students, mostly	4%	4%	0%		
Students, completely	1%	1%	0%		
Who controls or makes decisions about the criteria for grading assignments in this class?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The teacher, completely	76%	66%	-10%	0.522	18.996
The teacher, mostly	15%	17%	2%		
It's about half and half	5%	10%	5%		
Students, mostly	1%	2%	1%		
Students, completely	1%	1%	0%		

In this class, the topics just don't interest me, so I do just enough to get by, and no more	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	11%	12%	1%	0.239	24.073
Agree	16%	18%	2%		
Neutral	27%	28%	1%		
Disagree	29%	26%	-3%		
Strongly Disagree	15%	13%	-2%		
Some of the topics in my classes have been so interesting that I have done more reading or research outside of class to	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	7%	9%	2%	0.868	13.219
Agree	18%	20%	2%		
Neutral	29%	30%	1%		
Disagree	26%	22%	-4%		
Strongly Disagree	18%	16%	-2%		

This year, my classes have been more interesting than last year	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	21%	20%	-1%	0.333	22.144
Agree	32%	31%	-1%		
Neutral	28%	30%	2%		
Disagree	10%	9%	-1%		
Strongly Disagree	7%	6%	-1%		

In this class, what percentage of time do students spend listening to the teacher as a whole class?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
More than 80%	29%	29%	0%	0.914	12.065
61-80%	37%	36%	-1%		
41-60%	21%	23%	2%		
21-40%	8%	7%	-1%		
0-20%	4%	3%	-1%		
In this class, what percentage of time do students spend listening to other students discuss as a whole class?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
More than 80%	12%	12%	0%	0.964	10.214
61-80%	24%	23%	-1%		
41-60%	24%	24%	0%		
21-40%	20%	20%	0%		
0-20%	18%	17%	-1%		
In this class, what percentage of time do students spend working by themselves	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
More than 80%	19%	19%	0%	0.623	17.466
61-80%	25%	26%	1%		
41-60%	25%	27%	2%		
21-40%	19%	17%	-2%		
0-20%	10%	8%	-2%		
In this class, what percentage of time do students spend working in groups	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
More than 80%	12%	12%	0%	0.513	19.132
61-80%	24%	23%	-1%		
41-60%	26%	29%	3%		
21-40%	20%	19%	-1%		
0-20%	16%	14%	-2%		

In this class, what percentage of time do students spend talking with the teacher “one to one”	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	More than 80%	7%	9%	2%	0.654	16.991
	61-80%	14%	15%	1%		
	41-60%	19%	22%	3%		
	21-40%	25%	23%	-2%		
0-20%	33%	28%	-5%			
In this class, what percentage of time do students spend working with the teacher in a small group	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	More than 80%	5%	7%	2%	0.869	13.185
	61-80%	10%	12%	2%		
	41-60%	15%	18%	3%		
	21-40%	24%	20%	-4%		
0-20%	44%	38%	-6%			
In this class, what percentage of time do students spend not really paying attention or doing what they suppose to be doing	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	More than 80%	8%	9%	1%	0.970	9.871
	61-80%	11%	13%	2%		
	41-60%	14%	16%	2%		
	21-40%	20%	18%	-2%		
0-20%	45%	41%	-4%			
In this class, what percentage of time do students spend using computers	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	More than 80%	16%	21%	5%	0.064	30.381
	61-80%	20%	23%	3%		
	41-60%	21%	22%	1%		
	21-40%	19%	17%	-2%		
0-20%	22%	14%	-8%			

My grade in this class is based on class participation	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	8%	10%	2%	0.095	28.665
More than half of the grade	11%	12%	1%		
About half of the grade	19%	23%	4%		
Some, but less than half of the grade	44%	39%	-5%		
None or almost none	16%	13%	-3%		

My grade in this class is based on quizzes and tests	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	20%	21%	1%	0.385	21.204
More than half of the grade	40%	37%	-3%		
About half of the grade	28%	29%	1%		
Some, but less than half of the grade	8%	8%	0%		
None or almost none	2%	2%	0%		
My grade in this class is based on papers and reports	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	14%	13%	-1%	0.655	16.969
More than half of the grade	27%	27%	0%		
About half of the grade	25%	27%	2%		
Some, but less than half of the grade	17%	16%	-1%		
None or almost none	15%	14%	-1%		
My grade in this class is based on independent projects	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	10%	11%	1%	0.197	25.107
More than half of the grade	19%	20%	1%		
About half of the grade	21%	24%	3%		
Some, but less than half of the grade	25%	21%	-4%		
None or almost none	23%	19%	-4%		
My grade in this class is based on oral reports or presentations	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	7%	10%	3%	0.822	14.165
More than half of the grade	14%	15%	1%		
About half of the grade	18%	21%	3%		
Some, but less than half of the grade	24%	21%	-3%		
None or almost none	35%	29%	-6%		
My grade in this class is based on group projects	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
All or almost all of the grade	8%	9%	1%	0.754	15.383
More than half of the grade	15%	16%	1%		
About half of the grade	22%	26%	4%		
Some, but less than half of the grade	27%	24%	-3%		
None or almost none	25%	20%	-5%		

My grade in this class is based on work that is simply handed in and graded by the teachers	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	All or almost all of the grade	17%	17%	0%	0.236	24.156
	More than half of the grade	23%	21%	-2%		
	About half of the grade	24%	26%	2%		
	Some, but less than half of the grade	27%	25%	-2%		
None or almost none	7%	7%	0%			
My grade in this class is based on work that is shared in a meaningful way with an audience outside the classroom	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	All or almost all of the grade	6%	8%	2%	0.406	20.845
	More than half of the grade	9%	12%	3%		
	About half of the grade	14%	18%	4%		
	Some, but less than half of the grade	19%	18%	-1%		
None or almost none	50%	41%	-9%			

In my classes, I was tested on my understanding and not just my memory.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Strongly Agree	22%	24%	2%	0.030	33.508
	Agree	43%	40%	-3%		
	Neutral	25%	25%	0%		
	Disagree	6%	6%	0%		
Strongly Agree	3%	3%	0%			
I am proud of my school.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Strongly Agree	17%	17%	0%	0.002	42.852
	Agree	30%	29%	-1%		
	Neutral	31%	32%	1%		
	Disagree	10%	9%	-1%		
Strongly Agree	11%	10%	-1%			
I get excited about going to school.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Strongly Agree	7%	9%	2%	0.215	24.649
	Agree	15%	18%	3%		
	Neutral	36%	37%	1%		
	Disagree	20%	16%	-4%		
Strongly Agree	20%	17%	-3%			

I put more effort into school this year.	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	18%	19%	1%	0.588	17.996
Agree	34%	30%	-4%		
Neutral	29%	31%	2%		
Disagree	11%	11%	0%		
Strongly Agree	6%	6%	0%		
I am able to use things I learn in one subject (for example mathematics) to better understand another subject (for example, social sciences)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	N/A	16%	N/A	N/A	N/A
Agree	N/A	37%	N/A		
Neutral	N/A	29%	N/A		
Disagree	N/A	9%	N/A		
Strongly Agree	N/A	5%	N/A		
Compared to the beginning this year, I feel more confident about life after high school	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	20%	20%	0%	0.715	16.025
Agree	37%	35%	-2%		
Neutral	29%	30%	1%		
Disagree	8%	7%	-1%		
Strongly Agree	4%	4%	0%		
I feel ready for the real world, with reference to my technology skills	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	19%	19%	0%	0.112	27.882
Agree	35%	33%	-2%		
Neutral	31%	32%	1%		
Disagree	10%	8%	-2%		
Strongly Agree	4%	4%	0%		
The work I am doing in my classes will be useful to me in the job I hope to have as an adult	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	18%	17%	-1%	0.798	14.606
Agree	33%	33%	0%		
Neutral	29%	32%	3%		
Disagree	12%	10%	-2%		
Strongly Agree	6%	6%	0%		

I have often thought about becoming a teacher	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	11%	13%	2%	0.664	16.837
Agree	14%	17%	3%		
Neutral	19%	22%	3%		
Disagree	21%	18%	-3%		
Strongly Agree	34%	28%	-6%		
I think teaching mathematics or science would be fun	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	8%	10%	2%	0.827	14.062
Agree	14%	16%	2%		
Neutral	20%	23%	3%		
Disagree	21%	18%	-3%		
Strongly Agree	35%	29%	-6%		
I feel challenged at this school	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	11%	11%	0%	0.066	30.226
Agree	31%	30%	-1%		
Neutral	35%	36%	1%		
Disagree	13%	11%	-2%		
Strongly Agree	8%	8%	0%		
I feel that if I work hard I can be successful in my classes	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	43%	38%	-5%	0.413	20.729
Agree	37%	34%	-3%		
Neutral	13%	18%	5%		
Disagree	3%	3%	0%		
Strongly Agree	2%	2%	0%		
In my classes, a lot of time is spent answering questions from a book or worksheet	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Strongly Agree	13%	14%	1%	0.123	27.465
Agree	36%	34%	-2%		
Neutral	35%	34%	-1%		
Disagree	11%	10%	-1%		
Strongly Agree	3%	4%	1%		

The amount and rigor of class work my teacher assign is pretty typical of other classes I have taken.	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Strongly Agree	9%	12%	3%	0.668	16.766
	Agree	39%	35%	-4%		
	Neutral	37%	38%	1%		
	Disagree	9%	7%	-2%		
Strongly Agree	4%	4%	0%			
This school is providing me with a high quality education	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Strongly Agree	N/A	N/A	N/A	N/A	N/A
	Agree	N/A	N/A	N/A		
	Neutral	N/A	N/A	N/A		
	Disagree	N/A	N/A	N/A		
Strongly Agree	N/A	N/A	N/A			

Rate your interest in Reading/English language arts	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The most highly interested	15%	18%	3%	0.102	28.305
Highly interested	16%	16%	0%		
Interested	26%	27%	1%		
A little interested	24%	21%	-3%		
Not at all interested	17%	15%	-2%		
Rate your interest in Math	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The most highly interested	16%	16%	0%	0.085	29.121
Highly interested	18%	18%	0%		
Interested	24%	24%	0%		
A little interested	19%	18%	-1%		
Not at all interested	21%	20%	-1%		
Rate your interest in Science	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The most highly interested	20%	20%	0%	0.589	17.975
Highly interested	21%	20%	-1%		
Interested	25%	26%	1%		
A little interested	18%	17%	-1%		
Not at all interested	15%	15%	0%		

Rate your interest in Social studies	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
The most highly interested	19%	19%	0%	0.971	9.828
Highly interested	20%	20%	0%		
Interested	25%	25%	0%		
A little interested	18%	17%	-1%		
Not at all interested	16%	15%	-1%		

How long does it take to get a failed computer repaired?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1/2-1 hour	17%	19%	2%	0.020	47.956
1 - 3 hours	17%	17%	0%		
1/2 - 1 full day	21%	24%	3%		
2 - 5 days	22%	19%	-3%		
1 - 3 weeks	11%	9%	-2%		
A month or more	9%	9%	0%		
How long does it take to get a network services restored when the network goes down?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1/2-1 hour	22%	23%	1%	0.783	23.759
1 - 3 hours	24%	23%	-1%		
1/2 - 1 full day	28%	27%	-1%		
2 - 5 days	13%	13%	0%		
1 - 3 weeks	5%	4%	-1%		
A month or more	5%	6%	1%		
How long does it take to get help on a software problem or question?	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
1/2-1 hour	49%	44%	-5%	0.642	26.638
1 - 3 hours	17%	17%	0%		
1/2 - 1 full day	14%	17%	3%		
2 - 5 days	8%	8%	0%		
1 - 3 weeks	3%	3%	0%		
A month or more	5%	6%	1%		

In your classes, how often do your teachers have you use a word processor to write a story or report	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	11%	11%	0%	0.803	14.527
Rarely (a few times a year)	22%	22%	0%	0.803	14.527
Sometimes (once or twice a month)	40%	39%	-1%	0.803	14.527
Often (once or twice a week)	20%	18%	-2%	0.803	14.527
Almost Daily	6%	8%	2%	0.803	14.527
In your classes, how often do your teachers have you use software to learn and practice skills	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	14%	14%	0%	0.623	17.457
Rarely (a few times a year)	32%	28%	-4%		
Sometimes (once or twice a month)	31%	33%	2%		
Often (once or twice a week)	14%	14%	0%		
Almost Daily	6%	7%	1%		
In your classes, how often do your teachers have you use a spreadsheet to enter and calculate numbers or create graphs for an assignment (Excel, etc)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	28%	27%	-1%	0.636	17.259
Rarely (a few times a year)	33%	29%	-4%		
Sometimes (once or twice a month)	24%	27%	3%		
Often (once or twice a week)	9%	9%	0%		
Almost Daily	4%	4%	0%		
In your classes, how often do your teachers have you create a database of information for a class project (FileMaker Pro, Access, etc)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	39%	35%	-4%	0.087	29.052
Rarely (a few times a year)	30%	26%	-4%		
Sometimes (once or twice a month)	20%	24%	4%		
Often (once or twice a week)	6%	8%	2%		
Almost Daily	3%	3%	0%		
In your classes, how often do your teachers have you create a presentation and present information to classmates or others (PowerPoint, etc)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	11%	11%	0%	0.763	15.236
Rarely (a few times a year)	33%	29%	-4%		
Sometimes (once or twice a month)	38%	38%	0%		
Often (once or twice a week)	12%	13%	1%		
Almost Daily	4%	5%	1%		

In your classes, how often do your teachers have you communicate by email with friends, experts, and others about topics you are studying	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	47%	39%	-8%	0.882	12.884
Rarely (a few times a year)	20%	20%	0%		
Sometimes (once or twice a month)	16%	22%	6%		
Often (once or twice a week)	9%	9%	0%		
Almost Daily	6%	7%	1%		
In your classes, how often do your teachers have you use online discussions to gather information for an assignment (discussion boards, videoconferencing, etc)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	46%	39%	-7%	0.167	25.964
Rarely (a few times a year)	20%	21%	1%		
Sometimes (once or twice a month)	20%	24%	4%		
Often (once or twice a week)	8%	8%	0%		
Almost Daily	4%	4%	0%		
In your classes, how often do your teachers have you conduct Internet research on an assignment topic	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	7%	8%	1%	0.888	12.749
Rarely (a few times a year)	18%	18%	0%		
Sometimes (once or twice a month)	37%	39%	2%		
Often (once or twice a week)	25%	21%	-4%		
Almost Daily	11%	10%	-1%		
In your classes, how often do your teachers have you use tools, such as graphing calculators or digital microscopes, to analyze information	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	17%	17%	0%	0.336	22.088
Rarely (a few times a year)	19%	18%	-1%		
Sometimes (once or twice a month)	23%	27%	4%		
Often (once or twice a week)	18%	15%	-3%		
Almost Daily	21%	19%	-2%		
In your classes, how often do your teachers have you produce print products (with desktop publishing software)	Frequencies			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Never	28%	26%	-2%	0.729	15.803
Rarely (a few times a year)	27%	24%	-3%		
Sometimes (once or twice a month)	26%	30%	4%		
Often (once or twice a week)	11%	11%	0%		
Almost Daily	5%	5%	0%		

In your classes, how often do your teachers have you create multimedia reports or projects (with video, graphics, and sound editing)	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Never	N/A	30%	N/A	N/A	
	Rarely (a few times a year)	N/A	27%	N/A		
	Sometimes (once or twice a month)	N/A	27%	N/A		
	Often (once or twice a week)	N/A	8%	N/A		
Almost Daily	N/A	4%	N/A			
In your classes, how often do your teachers have you use technology to complete a test or quiz	Frequencies			Chi-Square		
	Pre	Post	Change	Pearson Chi-Square	p value	
	Never	32%	27%	-5%	0.991	8.146
	Rarely (a few times a year)	28%	27%	-1%		
	Sometimes (once or twice a month)	23%	27%	4%		
	Often (once or twice a week)	10%	10%	0%		
Almost Daily	5%	6%	1%			

Appendix E

Observations Tables and Analyses

CFF Observation Tables

Two sets of observations were conducted by CFF Data Collectors (individuals specifically assigned by their district and trained by the CFF evaluation team to conduct data collection). Often these individuals are building level or district administrators. Their unbiased observations form the core of our quantitative data set.

The observers were instructed to observe two teachers randomly selected by the CFF Evaluation team, once during the pre and once during the post window. We received a set of observations large enough (pre=235, post=186) to make generalizations about what is happening in the CFF program statewide.

Access to technology	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Teacher has access to computer	93%	100%	7%	N/A	N/A
Presentation station is available (projector, speakers)	52%	73%	21%	24.579	0.000
Electronic Whiteboard is available	23%	81%	58%	3.185	0.074
1 student per computer	29%	66%	37%	6.916	0.009
2 students per computer	0%	4%	4%	N/A	N/A
3-5 students per computer	3%	1%	-2%	29.994	0.000
More than 5 students per computer	18%	8%	-10%	13.144	0.000
Internet Access is available to all computers	83%	94%	11%	8.417	0.004

Organization of the Classroom	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Traditional rows	68%	53%	-15%	312.661	0.000
Small clusters of 3-5 student desks	7%	16%	10%		
Science Lab	2%	5%	2%		
Desks arranged in rows; students face each other	9%	11%	2%		
Circles or semi-circles	7%	6%	-1%		
Computer lab	8%	2%	-6%		
Outside of classroom	2%	0%	-2%		
Classroom arranged like a lab, or with computers along the wall	2%	2%	-1%		
Other, please describe and illustrate below	2%	6%	3%		

Beginning 1/3 of the class period - Classroom Teacher Activity	Mean			T-Test	
	Pre	Post	Change	t value	p value
Whole group lecture/instruction	35	22	-13	3.536	0.001
Leading a whole class discussion	22	26	5	-1.273	0.205
Working with a small group	6	12	6	-2.654	0.009
Working with individual students	11	17	5	-2.198	0.030
Walking, observing, and interacting with students	18	18	0	0.023	0.981
Working at desk, or other professional work not involving students	5	6	0	-0.053	0.958

Middle 1/3 of the class period - Classroom Teacher Activity	Mean			T-Test	
	Pre	Post	Change	t value	p value
Whole group lecture/instruction	25	12	-12	3.784	0.000
Leading a whole class discussion	21	22	1	-0.104	0.917
Working with a small group	9	20	11	-3.793	0.000
Working with individual students	17	24	7	-2.073	0.040
Walking, observing, and interacting with students	22	20	-2	0.540	0.590
Working at desk, or other professional work not involving students	5	3	-2	1.258	0.211

Final 1/3 of the class period - Classroom Teacher Activity	Mean			T-Test	
	Pre	Post	Change	t value	p value
Whole group lecture/instruction	20	11	-10	2.196	0.004
Leading a whole class discussion	19	20	0	0.082	0.935
Working with a small group	11	19	9	-2.862	0.005
Working with individual students	20	26	6	-1.703	0.091
Walking, observing, and interacting with students	19	21	1	-0.408	0.684
Working at desk, or other professional work not involving students	8	5	-2	1.148	0.253

Beginning 1/3 of the class period - Level of engagement	Mean			T-Test	
	Pre	Post	Change	t value	p value
Percentage of students engaged	84%	87%	3%	-1.263	0.209
Level of engagement	2.9	3.3	0.4	-3.622	0.000

Middle 1/3 of the class period - Level of engagement	Mean			T-Test	
	Pre	Post	Change	t value	p value
Percentage of students engaged	86%	87%	1%	-0.402	0.688
Level of engagement	3.1	3.4	0.3	-2.203	0.030

Final 1/3 of the class period - Level of engagement	Mean			T-Test	
	Pre	Post	Change	t value	p value
Percentage of students engaged	82%	82%	0%	0.017	0.986
Level of engagement	3.10	3.4	0.3	-2.612	0.010

Beginning 1/3 of the class period - Instructional Practices	Mean			T-Test	
	Pre	Post	Change	t value	
Complexity	3.40	4.20	0.80	-5.218	
Instructional Style	3.02	3.92	0.90	-5.606	
Relevance	3.43	4.11	0.68	-5.030	

Middle 1/3 of the class period - Instructional Practices	Mean			T-Test	
	Pre	Post	Change	t value	p value
Complexity	3.70	4.41	0.71	-4.965	0.000
Instructional Style	3.43	4.28	0.85	-2.851	0.005
Relevance	3.58	4.25	0.67	-4.934	0.000

Final 1/3 of the class period - Instructional Practices	Mean			T-Test	
	Pre	Post	Change	t value	p value
Complexity	3.75	4.47	0.72	-4.526	0.000
Instructional Style	3.37	4.23	0.86	-5.028	0.000
Relevance	3.61	4.27	0.66	-4.438	0.000

Classroom Management	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Excellent	46%	62%	16%	36.717	0.000
Good	43%	33%	-10%		
Fair	7%	4%	-3%		
Poor	2%	1%	-1%		

Teacher Comfort Level	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Could not tell	3%	1%	-2%	22.928	0.028
Teacher seemed completely uncomfortable	1%	0%	-1%		
Teacher seemed fairly uncomfortable	1%	2%	1%		
Teacher seemed fairly comfortable	23%	17%	-6%		
Teacher seemed completely comfortable	70%	81%	10%		

Teachers Use of Hardware	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Teacher use of Laptops	32%	65%	33%	0.622	0.430
Teacher use of Desktop Computer	26%	26%	0%	10.776	0.001
Teacher use of PDA's	0%	0%	0%	N/A	N/A
Teacher use of Calculators	17%	15%	-2%	26.448	0.000
Teacher use of Cameras, Still or Video	2%	13%	11%	0.304	0.581
Teacher use of TV/VCR	18%	12%	-6%	5.688	0.017
Teacher use of Probeware	2%	1%	-1%	60.966	0.000
Teacher use of Microscope camera/project	0%	1%	1%	N/A	N/A
Teacher use of LCD Projector	32%	52%	20%	0.143	0.705

Student Use of Hardware	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Student use of Laptops	11%	42%	31%	0.474	0.491
Student use of Desktop Computer	6%	6%	0%	19.103	0.000
Student use of PDA's	0%	0%	0%	N/A	N/A
Student use of Calculators	24%	27%	3%	32.076	0.000
Student use of Cameras, Still or Video	2%	8%	6%	0.180	0.671
Student use of TV/VCR	6%	2%	-4%	0.123	0.726
Student use of Probeware	2%	0%	-2%	N/A	N/A
Student use of Microscope camera/project	0%	0%	0%	N/A	N/A
Student use of LCD Projector	3%	9%	6%	0.406	0.524

Teachers Use of Software	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Teacher use of Educational management software – e.g. attendance, grades, lesson plans	10%	23%	13%	9.568	0.002
Teacher use of Word processing	9%	15%	6%	15.404	0.000
Teacher use of Data management (spreadsheets), graphing, or analysis software (EXCEL, SPSS, STATVIEW)	10%	17%	7%	10.182	0.001
Teacher use of Database software (FileMaker Pro, Microsoft Access)	12%	31%	19%	0.086	0.769
Teacher use of Presentation software (PowerPoint, Keynote)	12%	10%	-2%	17.748	0.000
Teacher use of Email	8%	18%	10%	3.624	0.057
Teacher use of Other communication tools (IM, discussion boards, video conferencing)	2%	3%	1%	0.077	0.782
Teacher use of Desktop publishing software	7%	14%	7%	10.347	0.001
Teacher use of Web publishing software	2%	6%	4%	0.123	0.726
Teacher use of Internet for research	4%	4%	0%	0.221	0.638
Teacher use of Multimedia reference CDs for research (e.g. online encyclopedias)	6%	11%	5%	0.953	0.329
Teacher use of Simulations/modeling software	2%	2%	0%	19.327	0.000
Teacher use of Software for video, graphics, and sound editing or production	2%	9%	7%	0.272	0.602
Teacher use of Probeware (devices for gathering experimental data)	3%	2%	-1%	14.121	0.000
Teacher use of Web based digital curriculum or curriculum resources	1%	2%	1%	0.017	0.897
Teacher use of Other Web-based learning activities	2%	5%	3%	5.366	0.021
Teacher use of Other (describe)	3%	9%	6%	0.366	0.545

Student Use of Software	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Student use of Drill & practice, ILS, or educational games	2%	15%	13%	0.371	0.542
Student use of Word processing	5%	22%	17%	0.076	0.783
Student use of Data management (spreadsheets), graphing, or analysis software (EXCEL, SPSS, STATVIEW)	7%	13%	6%	1.087	0.297
Student use of Database software (FileMaker Pro, Microsoft Access)	2%	21%	19%	0.274	0.600
Student use of Presentation software (PowerPoint, Keynote)	2%	7%	5%	3.069	0.080
Student use of Email	1%	12%	11%	0.140	0.708
Student use of Other communication tools (IM, discussion boards, video conferencing)	1%	2%	1%	N/A	N/A
Student use of Desktop publishing software	6%	22%	16%	0.246	0.620
Student use of Web publishing software	0%	7%	7%	N/A	N/A
Student use of Internet for research	0%	3%	3%	N/A	N/A
Student use of Multimedia reference CDs for research (e.g. online encyclopedias)	4%	16%	12%	0.054	0.817
Student use of Simulations/modeling software	3%	2%	-1%	0.068	0.794
Student use of Software for video, graphics, and sound editing or production	1%	8%	7%	0.089	0.765
Student use of Probeware (devices for gathering experimental data)	2%	2%	0%	0.034	0.855
Student use of Web based digital curriculum or curriculum resources	0%	0%	0%	N/A	N/A
Student use of Other Web-based learning activities	3%	5%	2%	0.212	0.685
Student use of Other (describe)	2%	12%	10%	8.521	0.004

Instructional Strategies	Frequency			Chi-Square	
	Pre	Post	Change	Pearson Chi-Square	p value
Teacher lecture or demonstration	54%	46%	-8%	37.622	0.002
Teacher-led discussion – low level, factual	47%	45%	-2%	22.946	0.028
Teacher-led high-level discussion w/ purposeful questions to students	41%	46%	5%	9.818	0.632
Project or problem based learning	39%	49%	10%	28.075	0.031
Authentic learning	42%	51%	9%	31.559	0.011
Multi-modal teaching (i.e., visual, auditory, kinesthetic)	36%	43%	7%	29.431	0.021
Peer teaching	31%	37%	6%	43.674	0.000
Collaborative learning – informal	38%	45%	7%	44.406	0.000
Collaborative learning – w/ formal roles	27%	33%	6%	46.031	0.000
WebQuests	22%	25%	3%	0.666	1.000
Learning centers	21%	23%	2%	68.727	0.000

Percentage of students who actively used technology	Mean			T-Test	
	Pre	Post	Change	t value	p value
Not at all	52%	23%	-29%	4.928	0.000
Briefly during the period	5%	6%	0%	-0.130	0.897
About one fourth of the period	7%	13%	5%	-1.436	0.154
About half of the period	7%	12%	6%	-1.845	0.068
About three fourths of the period	7%	9%	1%	-0.465	0.642
Almost the entire period	14%	32%	18%	-3.752	0.000

Percentages of students activity	Mean			T-Test	
	Pre	Post	Change	t value	p value
Listening to the teacher (in a large group setting)	36%	24%	-12%	4.078	0.000
Listening to other students (in a large group setting)	11%	19%	8%	-3.220	0.002
Working independently	21%	22%	1%	-0.381	0.704
Working in groups	13%	19%	5%	-1.844	0.068
Talking with the teacher in 1-to-1 or small group conversations	10%	12%	1%	-0.780	0.437
Off Task (not doing what the teacher intended)	5%	3%	-2%	2.403	0.018

21st Century Skills, Proficiencies, or Dispositions	Not at all			Somewhat			Substantially		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
Visual Literacy	37%	21%	-16%	36%	43%	7%	15%	31%	16%
Scientific Literacy	47%	45%	-2%	15%	18%	3%	9%	18%	9%
Cultural Literacy OR Global Awareness	50%	39%	-11%	19%	28%	9%	14%	23%	9%
Teaming OR Collaboration Skills	45%	36%	-9%	23%	33%	10%	16%	24%	8%
E-Communication Skills	68%	67%	-1%	6%	13%	7%	3%	5%	2%
Social OR Personal Responsibility	50%	34%	-16%	22%	36%	14%	11%	20%	9%
Self-Direction	30%	19%	-11%	38%	43%	5%	21%	33%	12%
Creativity	49%	36%	-13%	23%	27%	4%	16%	30%	14%
Higher-Order Thinking	23%	16%	-7%	37%	31%	-6%	30%	49%	19%
Use of Real World Tools	44%	31%	-13%	32%	34%	2%	13%	29%	16%
Ability to Produce High-Quality Products	61%	44%	-17%	15%	18%	3%	11%	25%	14%
Planning, Prioritizing, and Managing Work	46%	36%	-10%	23%	27%	4%	18%	27%	9%

21st Century Skills, Proficiencies, or Dispositions	Chi-Square	
	Pearson Chi-Square	p value
Visual Literacy	17.134	0.136
Scientific Literacy	95.914	0.000
Cultural Literacy OR Global Awareness	69.086	0.000
Teaming OR Collaboration Skills	27.882	0.006
E-Communication Skills	34.712	0.001
Social OR Personal Responsibility	33.492	0.001
Self-Direction	8.627	0.734
Creativity	31.428	0.002
Higher-Order Thinking	22.409	0.033
Use of Real World Tools	25.731	0.012
Ability to Produce High-Quality Products	23.816	0.022
Planning, Prioritizing, and Managing Work	28.425	0.005

Teaching in Pennsylvania (TPR) Data Table

As discussed in Appendix B, the TPR observations were conducted during the same window as the CFF Technology Observations. Data collectors were encouraged to observe two teachers twice during the pre and post windows. We received enough observations (pre=341, post=339) to describe the effects of CFF across the larger population. Below is the data table that displays what these observers recorded.

TPR Domain	Pre (n=234)	Post (n=236)	Mean Difference	T-Test	
	Mean	Mean		t value	p value
Focus/Capacity	11.12	13.08	1.96**	3.286	0.001
Social System	16.21	18.14	1.93	1.832	0.068
Syntax	14.04	14.25	0.21	0.277	0.782
Principles of Reaction	21.10	23.9	2.80	1.960	0.051
Provisions for Evaluation	13.94	16.18	2.24*	2.505	0.013